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ABSTRACT

To analyze the directions of change in health-related employment in Ohio over the next decade in order to provide limited guidelines for the development of education and training programs in the allied health field, an examination was made of health manpower data derived from the 1950-1970 U.S. Censuses. The examination revealed that the health manpower stock has grown at a very rapid rate over the past 20 years and is projected to increase at an even faster pace over the coming decade. The growth in health-related employment has occurred in those job functions generally requiring less education and training than those occupations traditionally identified with the health care field, e.g., the physician. These allied health manpower functions have been expanding at three to four times the annual rate of growth of highly-trained core practitioners. Several educational policy implications resulting from this and other trends include: (1) Educational resources must expand to operate the training system needed to meet the demand for trained manpower, (2) Greater attention must be accorded health-related education, which implies a shift away from university-level programs to secondary and junior college programs, and (3) There will be increasing need for coordinating the entire health training system. (Author/SB)

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ALLIED HEALTH MANPOWER IN OHIO

EMPLOYMENT TRENDS AND PROSPECTS

Prepared By

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Sponsored by

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ALLIED HEALTH MANPOWER IN OHIO

Employment Trends and Prospects

by

Thomas N. Chirikos, Ph.D.

1972

Center for Human Resource Research
The Ohio State University
Columbus, Ohio

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PREFACE

This study was sponsored by the Advisory Council for Vocational Education of the State of Ohio. It was undertaken as a function of the Advisory Council's broad interest in training and employment in the service industries. The project was designed and funded to be carried out in a three month period. As such, it is meant to provide an overview of allied health manpower employment trends and prospects in Ohio, and thereby to be used as a point of departure for future discussions of education and manpower policy requirements. Hopefully, the Advisory Council will find it useful in this way for their important work in the field of vocational and technical education.

As is typical, even in a study of limited scope, the persons who contributed to the final product are far too numerous to be acknowledged individually. I would, however, like to thank Mr. William Papier of the Ohio Bureau of Employment Services and Chairman of the Advisory Council's sub-committee on the service industries for his help throughout the course of the project. I would also like to thank the former Executive Secretary of the Advisory Council, Mr. Warren Weiler for his assistance in arranging contractual matters.

I must also acknowledge the able research assistance provided to me at various points by Theodore Wille and Sylvia Fubini. Indeed, their contributions were so great that I am somewhat hesitant to indicate, as I must, that any remaining errors of fact or interpretation are my own. Finally, let me acknowledge the skill of the Center's secretarial staff in dealing with problems of poor penmanship and contract deadlines. My thanks, in particular, are extended to Miss Kay Cameron and Mrs. Janie York for typing various portions of the text and tables.

CONTENTS

I. SETTING THE STAGE 1

The Objective Defined 3

The Analytic Framework 5

The Data: Sources and Uses 8

The Meaning of Requirements 16

II. ALLIED HEALTH MANPOWER IN OHIO: TWO DECADES OF GROWTH 20

Health Service Industry Employment 20

The Division of Labor 31

Health Manpower in Ohio: Detailed Characteristics 40

III. OHIO'S REQUIREMENTS FOR ALLIED HEALTH MANPOWER IN THE 'EIGHTIES 51

Health Manpower Requirements, 1970-1980 53

Occupational Projections, 1970-1985 65

Balancing Allied Health Manpower Requirements and Supply 68

IV. POLICY IMPLICATIONS 79

TABLES

II.1 Total Employment and Health Service Industry Employment, United States and State of Ohio 22

II.2 Health Service Industry Employment: Proportion Female, United States and State of Ohio, 1950-1970 25

II.3 Total Employment and Health Service Industry Employment, by Region and County, State of Ohio, 1970 26,27,28

II.4 Regional Distribution of Total Employment and Health Service Industry Employment, State of Ohio, 1970 29

II.5 Estimated Employment in Health Occupations, State of Ohio, 1950-1970 33

II.6 Employment in Core and Allied Health Occupations, United States and State of Ohio, 1950-1970 35

II.7 Health Manpower Employment Elasticities, by Industry Division and Occupational Category, United States and State of Ohio, 1950-1970 36

II.8 Estimated Employment in Selected Allied Health Occupations, State of Ohio, 1970 42

II.9 Employment in Health Occupations by Region and County, State of Ohio, 1970 44,45,46

II.10 Regional Distribution of Population and Employment in Health Occupations, State of Ohio, 1970 47

II.11 Percentage Distribution of Health Manpower Employed in Standard Metropolitan Statistical Areas, by Occupational Categories, State of Ohio, 1960-1970 49

III.1 Projected Health Manpower Requirements by Industry Division and Major Occupational Category, State of Ohio, 1980 57

TABLES

III.2 Comparison of Projected and Historical Growth Rates of Employment in Health Occupations and the Health Service Industry, State of Ohio, 1950-1980 59

III.3 Projected Percentage Increase in Health Manpower Employment Required to Equalize Regional Manpower/Population Ratios in 1980, by Major Health Occupation Categories and Regions, State of Ohio, 1970-1980 64

III.4 Projected Gross Requirements for Allied Health Personnel, by Selected Occupational Categories, State of Ohio 1980-1985 67

III.5 Projected Net Annual Requirements for Allied Health Personnel, by Occupational Category, State of Ohio, 1970-1980 and 1980-1985 73

III.6 Proportion of Annual Net Requirements for Selected Allied Health Manpower Satisfied by Estimated Number of Persons Being Graduated from Existing Education and Training Institutions, by Occupational Category, State of Ohio, Circa, 1970 76

I

SETTING THE STAGE

Almost unnoticed in the mounting concern and debate over the "crisis" in health care is the fact that revolutionary changes have occurred since World War II in the ways in which health services are produced. Pressed by increased demand for services and assisted by scientific breakthroughs, the technology of delivering health care has been significantly altered over the past three decades in a form that parallels the growth of other productive activities: the utilization of capital equipment has expanded and the division or specialization of labor has increased. Even to the casual observer, these changes appear to be of considerable importance; their impact will likely be felt for years to come.

With respect to health manpower, for instance, it was possible only a short time ago to count the different types of personnel utilized in providing health care easily on the fingers of two hands; at present, upwards of twenty hands are needed to enumerate the specialized job functions performed in promoting good health and caring for the ill. Furthermore, the types of jobs that have been created in this move toward greater specialization generally require less education and training than those functions traditionally identified with the health field. Indeed, no longer is the health care system manned, in large measure, by those who have earned doctoral degrees, but rather by persons with substantially less (albeit more specialized)

training who perform functions "allied" to the highly skilled practitioner. Such allied workers now constitute the majority of all persons employed in the health care field; prospects are that this proportion will grow even larger over the next decade.

This trend has a number of important implications for public policy and programs. For one thing, to the extent that public policy is mandated to augment the supply of health manpower to bring it into balance with the demand for health care services, policy must be concerned with the entire range of personnel employed in this field. This implies that it is increasingly inappropriate to focus policy exclusively upon the traditional members of the health manpower team--e.g., the physician and the nurse--for this tends to exclude a number of pressing manpower issues. In particular, the extensive and somewhat traditional concern about physician shortages may no longer be warranted, not because such shortages are unimportant, but because this concern tends to focus upon only one dimension of a multi-dimensional problem. Thus, whether or not physician shortages actually exist need not be debated here. Rather what must be emphasized is that the pool of manpower utilized in delivering health services is no longer coterminous with the functions performed by physicians and their traditional associates; consequently, policies designed to modify the supply conditions of manpower for such services must be extended in scope.

Another, and perhaps more significant, implication relates to the role played by educational institutions and training systems in modifying the supply of health manpower. Two points are noteworthy in this regard: First, although the traditional nexus between health manpower and educational policy has been focused at the level of the

university--typically at the post-baccalaureate level of instruction--the trend toward the increased utilization of allied health personnel has shifted this focus to lower levels of the educational structure, generally somewhere between the high school diploma and the baccalaureate degree. This implies, among other things, that the vocational/technical education components of a community's school system now have an augmented role to play in training manpower for the health delivery system.

Secondly, while lesser-skilled health workers have typically been trained in informal and frequently ad hoc programs in health institutions, their numerical growth over the past decade has tended to place considerable pressure upon the formal school system, particularly the public component of that system, to become involved in the training of such manpower. A shift away from informal, on-the-job training toward more formal schooling for many types of allied personnel now appears to be taking place. To the extent that this shift continues, the formal school system will have an increasingly important role to play in training manpower for the health services, and thereby a role in determining the quantity and quality of such services available to the public. It is a role, of course, that the formal school system can hardly afford to ignore.

THE OBJECTIVE DEFINED

Given these trends, the need to assess health manpower training requirements and priorities assumes considerable importance. One way of carrying out such an assessment is to examine the employment requirements for health manpower over time and to use the results as a gauge of needed changes in educational policy, either in degree or kind. Briefly put, this is the goal of the present report. Its

principal objective is to analyze the directions of change in health-related employment in the State of Ohio over the next decade and, in so doing, provide limited guideposts for the development of formal education and training programs in the allied health field. Needless to say, this task is neither easy nor clear-cut; but even crude indicators of probable changes hopefully will prove useful to those whose job it is to decide upon and implement educational priorities.

More particularly, our objective in the following is the limited one of providing a quantitative description of the past trends in and future prospects of allied health manpower employment in Ohio. This objective is limited in the sense that we do not consider a number of important related manpower and educational issues, such as the appropriate curriculum for training allied health workers, the licensing or certification of such personnel, or the reward structure and incentive systems in allied health manpower markets. As important as they are, these issues must await more detailed study. Our analysis seeks only to quantify the size and characteristics of the employed stock of health manpower, and to use this information to project the employment requirements for allied health personnel over the next decade. Ideally, these projections will provide a somewhat firmer basis for estimating needed changes in health manpower education and training policy, particularly at the vocational/technical level of the school system.

Subsequent sections of the paper, therefore, in turn consider a) the historical trends and current employment of allied health manpower in Ohio, and b) the projected employment requirements in health-related occupations over the period 1970-1985 together with estimates of the

extent to which existing educational programs in Ohio are equipped to satisfy these requirements. A summary of, and the policy recommendations which emerge from, the analysis are then given. Before we turn our attention to these tasks, however, several matters must be discussed briefly in order to set the stage. These include the framework used in the study, data sources and uses, and the meaning of the concept of employment requirements. The remainder of this section discusses each of these matters in turn.

THE ANALYTIC FRAMEWORK

For reasons to be discussed momentarily, we have used the total health manpower stock as a framework for and unit of analysis of this study. The principal implication is that we do not examine individual health-related occupations in independent fashion nor do we, generally speaking, examine allied health manpower independently from other kinds of health-related personnel. Our primary focus, in other words, is on the aggregate pool of manpower required in the production or provision of health care services.

It must be noted, however, that we are interested in the health manpower stock almost exclusively from the point of view of specific health-related or health-oriented occupational functions, i.e., those functions requiring some specialized knowledge about health or the provision of medical care. This means that we do not examine (except in aggregate form) all of the various types of manpower employed in health care institutions, for obviously there are many occupational functions called for in operating these activities which require little or no specialized knowledge about the health field. For instance, the

plumber employed in a hospital or the typist employed by a physician perform functions that differ very little, if at all, from plumbing and typing jobs, say, in a manufacturing establishment. As such, they are defined (for present purposes) as being non-health related occupations. On the other hand, there are a number of health-related occupational functions which are not carried out exclusively within health care institutions: the registered nurse employed in a primary school is an obvious illustration. Because these functions are health-related we have included them within our scope of interest. Thus, while we are interested essentially in examining the stock of health manpower employed in the health care delivery system, the scope of our inquiry is simultaneously both broader and narrower than that stock. We shall have more to say about this distinction below.

The reasons for using the total stock of health-related manpower as a frame of reference for the study are twofold: First, and foremost, the pool or stock of health manpower jointly produce a set of services--health care services--and are thus inextricably tied together in various technological or organizational forms. This being so, the requirements for various categories of personnel cannot be considered independent of the needs for the entire range of personnel performing health-related job functions. The implication is that one must first examine the broad range of manpower inputs required to produce a specific set of health services, and then assess the relative contributions of various types or categories of trained personnel to determine the appropriate mix that is required.

In addition to the technological or organizational interdependence among health-related occupational functions, an examination of the

entire health manpower stock also has the advantage of permitting an assessment of substitution or trade-off possibilities between (and among) various classes of health workers. Although we will discuss this point in greater detail in a subsequent section of the paper, let us indicate here that there is every reason to believe that the relative components of the health manpower stock are not rigidly fixed or determined; hence, there are opportunities for substituting certain kinds of job functions for others within the health field. Sketchy as it is, the historical record suggests that this is happening, although the precise direction and magnitude are still not clear. Additional research will be needed before one can be sure about the nature of this substitution process; but even in its absence, it seems worthwhile to examine the health manpower stock in broad terms so as to account (however indirectly) for trade-off possibilities among skill inputs.

Second, and related to the foregoing, is that with the rapid expansion and creation of new health occupations over the past two decades, one is not wholly on firm ground in dealing with detailed individual occupations on a piece-meal basis. Hopefully, one can obtain a sense of future requirements in terms of the overall manpower structure, without necessarily hinging the conclusions exclusively upon the estimates of several narrowly defined job categories. For these reasons, then, we examine the health manpower stock and its several component parts in general, although we are principally interested in only a portion of that stock, viz., allied health manpower. To define that focus further, we must of necessity turn to the question of the available statistical resources for the study.

THE DATA: SOURCES AND USES

It is almost a truism that any quantitative description of the health manpower stock will only be as good as the primary data upon which it is based. Thus, what is at root is a very technical question, nonetheless deserves comment here, because it affects not only the way in which we were forced to proceed in carrying out the assessment, but also the interpretation of the results of the study. Briefly put, the problem is that insufficient data were available to provide a completely accurate picture of the health manpower situation in Ohio or, indeed, even for the nation as a whole. The analysis, accordingly, had to be adjusted to this fact.

For instance, in order to fulfill the general objectives of the study it was essential to quantify the employment characteristics of the health manpower stock, especially in terms of the numbers currently employed in specialized health-related occupational functions as defined above. This requirement tended to rule out much of the available information on the health manpower stock at both the State and national levels, for it is derived primarily from registry and licensure records. The difficulty, of course, is that such records frequently are not accurate, either because the employment status of the registrant is not available or (at least) not up-to-date. More important is the fact that our interest in the allied component of the manpower stock means that we are concerned with occupational groups well beyond those for which certification or registration is required. At the present time, for instance, only thirteen health occupations require licensing in the State of Ohio, which is obviously only a small proportion of the total number of occupations in which we have an interest.

A reasonably satisfactory solution to this sort of problem is to survey the employment patterns of the health care sector periodically. Our terms of reference and resources precluded this possibility, although it is to be hoped that such surveys ultimately will be carried out in the State on a regular basis. But even if a survey had been carried out, our problem would not have been wholly resolved. The reason is that we required employment data in multi-dimensional terms: distributions by occupation, industry, geographic area, and time were needed. Indeed, the latter is particularly significant, for trends surely cannot be analyzed without a consistent set of data (particularly in terms of consistent definitions and collection procedures) for at least several points in time. Such a set of data had to be found if the study was to be carried out; the only effective alternative was to utilize Census materials.

For this reason, our analysis is built primarily upon health manpower employment data derived from the 1950-1970 U.S. Censuses of Population. This fact is of critical importance and hence worth discussing briefly. To begin with, the use of this data source meant that the operating definition of health manpower in general and allied health manpower in particular had to be derived from the occupational classification systems utilized in Census publications. Unfortunately, the number of health-related occupations typically delineated in the Census is more limited in scope than is desirable from the point of view of this study. For instance, the occupational classification system used in the 1950 and 1960 Censuses of Population identified only sixteen specific occupational categories for which some specialized knowledge of the health area is required. Twelve of these occupations

were classified within the general category of Professional, Technical, and Kindred Workers; included were chiropractors, dentists, dietitians and nutritionists, professional nurses, student nurses, optometrists, osteopaths, pharmacists, physicians and surgeons, medical and dental technicians, therapists and healers (n.e.c.), and veterinarians. Three occupations were classified under the general heading of Service Workers; included here were attendants and aides in hospitals and other medical care institutions, practical nurses, and midwives. The remaining occupation, attendants in physicians' and dentists' offices, was classified with clerical occupations.

Between 1960 and 1970, the Census occupational classification system was revised and expanded from 297 to 441 occupations; the number of health related occupations correspondingly increased from 16 to 23.[1] The Professional and Technical category eliminated the 1960 occupations of student nurses, medical and dental technicians, and therapists and healers, n.e.c., and included (in addition to the remaining 1960 categories) the following occupations: podiatrists; health practitioner, n.e.c.; therapist; clinical laboratory technologists and technicians; dental hygienists; health record technologists and technicians; and technologists and technicians, n.e.c. The Health Service Worker category was expanded to include dental assistants; health aides, exec. nursing; health trainees; midwives; nursing aides; orderlies, and attendants; and practical nurses. Unfortunately, the preliminary 1970 Census data on employment by occupation

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[1] See, for example, Stanley Greene, John Priebe, and Richard Morrison, "The 1970 Census of Population Occupation Classification System", Statistical Reporter, (December, 1969), pp. 77-84.

that were available to us, viz., data derived from the Ohio Fourth Count Summary (computer) Tape, were aggregated into but three general categories: physicians, dentists, and related practitioners; medical and other health workers, except practitioners; and health service workers. While these categories include the twenty-three occupations specified above, this level of aggregation was clearly inappropriate to our needs.

The absence of highly dis-aggregated employment data, particularly in the 1970 Census of Population, required that we restrict the scope of the analysis to manpower identified essentially with the medical care service system. The group of occupations beginning to emerge, say, in the area of enviromental health services, therefore, had to be excluded from the analysis. The same is true for a number of relatively new high-level health occupations, such as bio-medical engineering, medical computer sciences, health economics, medical sociology, and the like. In all of these cases, there was insufficient information to permit breaking such figures out of Census aggregates. Thus, the scope of the study is limited at various points to persons employed either in the health care "industry" or in health-related occupations, each as defined specifically by the U.S. Bureau of the Census.[2] While limited in scope, we estimate nonetheless that the study includes approximately eighty-five percent of all health-related job functions--defined broadly--and is therefore fairly representative of the entire field.

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[2]The health care "industry" refers throughout this study to Major Group 80--Medical and other Health Services--of the Standard Industrial Classification used by Federal agencies. It classifies employment in offices of physicians, dentists, and related practitioners, hospitals, medical and dental laboratories, and health and allied services, n.e.c., such as birth control clinics, blood banks, and rehabilitation centers.

Within the scope of the data set derived from Census sources, then, we attempted both to classify and refine the information in ways that would facilitate the analysis. In the first instance, an (health) occupational classification scheme was devised which divided the health manpower stock into two principal components: 1) core practitioners and 2) allied health personnel.[3] The former categorizes almost all of the high-level health professional occupations and includes those personnel who exercise independent judgment and assume ultimate responsibility for persons entrusted to their care. Physicians and dentists are the prominent members of this group, but it also includes optometrists, pharmacists and related workers.[4] One important factor distinguishes this group: all have had post-baccalaureate training and a large proportion have earned doctoral degrees. In an analysis primarily designed to examine the educational implications of changes in the health manpower stock, a classification which distinguishes such educational differences is clearly a useful one.

Allied manpower are thus defined (for working purposes) as all of those personnel "allied" in some fashion or another to these core professionals. While this definition differs somewhat from the way in which the term has been used elsewhere, it was the only effective

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[3]This distinction follows closely the classification and nomenclature originally utilized by Harry Greenfield. See his Allied Health Manpower: Trends and Prospects, (New York: Columbia University Press, 1969), especially pp. 22-37.

[4]Specifically, the core category is defined as the 1970 Census aggregate entitled Physicians, Dentists, and related Practitioners which includes chiropractors, dentists, optometrists, pharmacists, physicians and osteopaths, podiatrists, veterinarians, and health practitioners, n.e.c. Census data from 1950 and 1960 were aggregated and adjusted to correspond to this working definition.

choice open to us, given the available information. Such a grand classification appeared to be difficult to interpret, however, so it was divided to distinguish, in very general terms, the relative skill levels of persons employed in allied job functions. While three or four such sub-classifications would clearly have been preferable--each divided, say, by incremental differences in educational training--the available statistical material permitted only two. We have arbitrarily chosen to call these categories skilled and semi-skilled.[5]

The skilled group includes all of those health-related occupations classified under the Census Code of Professional, Technical, and Kindred Workers exclusive of those classified as core professionals or practitioners. In general terms, this category includes professional (registered) nurses, medical and dental technicians and technologists, therapists, and related workers.[6] The distinguishing characteristic of this set of occupations is that they require a reasonable amount of special training before persons are allowed to perform them. In some cases, these jobs require specialized training at, or very close to, the baccalaureate level. Although standards are not uniform and it is

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[5]Let us stress that this distinction is clearly arbitrary and refers only to relative differences in educational attainment. The semi-skilled category is typically used for "operative" job functions which require only a short duration--say, a few weeks--of specialized training. While the health service workers classified as semi-skilled frequently have more than a few weeks of training, this title seems nonetheless to be relevant because of the higher than average amount of training required for all health-related employment.

[6]Specifically, this category is defined as all professional and technical level occupations exclusive of core practitioners as classified in the 1970 Census of Population. Census data for 1950 and 1960 were aggregated and adjusted to correspond to this definition.

therefore difficult to specify the range of educational experience that persons in this group will have had, it seems clear that almost all will have completed at least two years of training beyond high school, and probably, on the average, a little more.

The "semi-skilled" group of allied health occupations refers to all other occupations identified as being health-related in the 1970 occupation classification scheme used by the Bureau of the Census.[7] In general, these job functions are grouped under the classification of Service Workers; they include all functions for which some special training is required. The duration of such training is at most two years beyond high school and, on average, less than one year. This category, consequently, includes practical nurses as well as nursing aides and orderlies, medical and dental assistants, and laboratory assistants and aides. It rounds out the three major health-related occupational groups which this study analyzes.

Since, as suggested above, there was not sufficient occupational detail in the Census figures on health-related employment, we attempted to refine the data set by estimating the dis-aggregated components of each of the major census occupational categories. That is, we used the census definitions and data as "control totals", and attempted to piece together the detail within each of the totals by using supplementary materials. In general terms, such supplementary data were derived from

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[7] Specifically, this group is defined as those employed persons classified as health service workers in the 1970 Census of Population. Census data for 1950 and 1960 were aggregated and adjusted to correspond to this definition.

registry, licensure, and ad hoc survey data obtained from local sources.[8] These data were used to ascertain the relative employment patterns or relationships between and among various (detailed) occupational categories. The "relatives" were then incorporated into the Census totals to yield an estimate of employment by dis-aggregated health-related occupations in the State. Such an estimating procedure is quite crude, of course, but the results appear to us to be reasonable.

Given these procedures, it perhaps bears repeating that the Census was exploited because it was the only source of data that provided a consistent data set across occupational categories, industry divisions, geographical areas, and time. The estimates made in the process of carrying out the analysis were fitted or forced into the same consistent framework. The criterion of consistency, in other words, was considered to be of primary importance. Thus, even if some of the data that we have used are in error, the fact that they are defined and were collected in consistent fashion means that they will not detract from the study as much as if the opposite were true. This fact, among all others, tends to distinguish the statistical material in this report from most of the others currently being utilized in the health manpower field in the State.

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[8] In addition to registry data obtained from relevant State agencies, information contained in U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, Health Resources Statistics 1971, (Rockville, Md.: The Department, 1972) was extensively used. Furthermore, local occupational surveys conducted by both the Ohio Bureau of Employment Services and a private consulting firm were examined to obtain insights about the occupational characteristics of employed health workers.

THE MEANING OF REQUIREMENTS

Within the framework, data limitations, and manpower classification scheme described above, this study attempts specifically to quantify both the trends in and requirements for allied health manpower in the State of Ohio over the next dozen years. Since much depends upon the manner in which the term requirements is interpreted, we conclude this initial section by briefly exploring its meaning.

Let us begin by suggesting what the term requirements does not mean: the unconditional prediction of future events. That is, the analytic tools employed in the study do not purport to be the modern equivalent of the crystal ball; nor is the analyst a modern version of the ancient soothsayer. Rather, the task should be interpreted as one of assessing probable or needed changes over time, given certain conditions or assumptions about social parameters over the planning period. In other words, the projections are conditional, depending upon the assumptions specified.

While the specific assumptions we have used will be delineated in a subsequent section, it is important at this point to note that (as discussed earlier) we are primarily concerned with the future employment of health manpower. This implies that we are attempting to ascertain the relative numbers of workers who will find jobs or, conversely, the numbers of job functions seeking workers at given points in time. Now, from a conceptual point of view, such an attempt should be made only in reference to the projected configuration of the health care delivery system and the general need for health services

over the course of the next decade.[9] This stems from the obvious fact that health manpower is but one type of input into the provision of such services, and as such, the numbers required should be derived from the requirements for given service elements in the health care system. To the extent that various service components will (or be required to) change over time, e.g., to the extent that imbalances between acute and preventive care or outpatient and inpatient services change, there will be a corresponding shift in the specific types of health manpower needed--given the plausible assumption that identical numbers and types of personnel are not required to man different service components. Theoretically, then, one ought to begin the analysis with projections of required services and service weights, and then derive the manpower implications of those specific choices.

For fairly obvious reasons, we have not been able to carry out this study in the fashion just described, except in very indirect ways. Indeed, our approach had been, of necessity, partial in nature; it hinges upon the plausibility of the implied changes for health care system parameters outside of those directly related to health manpower. This problem has been dealt with by relying heavily upon forecast changes at the national level, some (forecasts) of which have been examined for the implications with respect to the number and types of services,

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[9]The general need for health services, in turn, should be derived from an analysis of the health problems and health behavior of specific population groups.

physical facilities, organization, and the like.[10] The manner in which we have linked State projections to those at the national level will be explored below; what is important here is that only through such indirect methods have we attempted to examine the interdependence between service requirements and manpower requirements. If the health care system develops in different directions, our estimates must be modified accordingly.

Let us, however, face the matter squarely: any decisions made to train additional health manpower or to modify the supply of health manpower in other ways carries a set of implicit assumptions with respect to the potential development of the health care system. To the extent that the projections contained herein are utilized as criteria for assisting educational decision-makers, they make some of these assumptions explicit. The point is, of course, that the study has been prepared to provide such assistance; it is not a plan for the entire health delivery system. This must be borne in mind in interpreting the analysis which follows.

In simple terms, then, the projection of requirements is an explicit assessment of the likely pattern of employment changes in health occupations under specified conditions. As such, they reflect the general direction as well as rough magnitudes of needed changes in the supply of such manpower. While the supply of health manpower may be molded by policies outside of the educational sphere, it is clear

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[10] As will be seen, we have relied heavily upon the national forecasts made in the framework of the Bureau of Labor Statistics, National Industry-Occupational Matrix. See U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Bulletin No. 1606 (February, 1969), Vol. I-IV and Tomorrow's Manpower Needs, Bulletin 1737 (1971), Vol. IV, Revised Edition, passim.

that the educational system will make a major contribution. We have thus attempted to draw-off the implications of these employment projections for educational policy. It is to these tasks, therefore, that we now turn.

II

ALLIED HEALTH MANPOWER IN OHIO: TWO DECADES OF GROWTH

This section attempts to provide a reasonably accurate statistical picture of the current size and distribution of the health manpower stock in Ohio as well as the changes that have occurred in the stock over the past twenty years. We shall also examine the situation in Ohio relative to the nation as a whole, the purpose of which is to ascertain the extent to which changes in Ohio reflect national trends and thereby the extent to which Ohio's supply of health manpower may be shaped by factors common to all states. The analysis is designed both to describe the growth in health-related employment and to lay the necessary ground-work for projecting future health manpower requirements. In terms of our interest in the health manpower structure, an appropriate point of departure is the trends in total health service industry employment within the State of Ohio.

HEALTH SERVICE INDUSTRY EMPLOYMENT

In 1970, approximately one out of every eighteen working persons in the United States and in Ohio was employed in the health service industry as defined by the Bureau of the Census. This was not always so, of course, but the last few decades have witnessed this sector develop into one of the principal employers of the American labor force and one of the few genuine growth industries in the economy. At the national level, for example, this industry employs substantially more persons than does the entire agricultural sector and almost as many as the total construction industry; it has roughly six times the employment of the

automobile industry, and perhaps eight times as many workers as the steel industry. The health service industry has grown at an annual average rate of 4.8 percent over the past two decades, which is approximately three times faster than the rate at which total employment has increased.[1] Prospects are that this growth rate will extend over the next decade or so, implying that the health service industry will account for even larger proportions of the labor force. Such prospects stem from the simple fact that the health care industry has been and continues to be highly labor intensive and since it has not (apparently) experienced major changes in productivity, even minor increases in the demand for health services have tended to expand employment opportunities.

As Table II.1 indicates, the trend in Ohio has been very close indeed to the national growth in employment in the health service industry. In 1950, the industry accounted for about 2.7 percent of total employment, grew to almost 4 percent in 1960, and then expanded to more than 5 percent in 1970. Overall, this meant that the industry was growing at almost 3.5 times the rate at which total employment increased, i.e., for every one percent increase in total employment in the State each year, there was a 3.5 percent increase in health service sector employment. Of significance is that the hospital component of the sector was growing at a substantially higher rate, even somewhat faster than the nation, over a portion of the period in question. There is, nonetheless, a

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[1]Because we are dealing with a compound interest-like phenomenon, we have computed and used throughout this section average annual (or geometric average) rates of growth rather than simple percentage increases.

Table II.1

Total Employment and Health Service Industry Employment,
United States and the State of Ohio
1950-1970

Area and Industry Division	Number of Employed Persons						Average Annual Growth Rate		
	1950		1960		1970				
	Number (000)	Percent	Number (000)	Percent	Number (000)	Percent	1950-70	1950-60	1960-70
United States									
Total, All Industries	56,435.3	100.00	64,639.3	100.00	76,553.6	100.00	1.6	1.4	1.7
Health Service Industry	1,669.4	2.96	2,578.2	3.98	4,246.2	5.55	4.8	4.5	5.1
Hospitals	989.9	1.76	1,683.9	2.60	2,689.7	3.52	5.1	5.5	4.8
Other Health Services	679.4	1.20	894.3	1.38	1,556.5	2.03	4.2	2.8	5.7
State of Ohio									
Total, All Industries	3,058.9	100.00	3,504.9	100.00	4,063.8	100.00	1.4	1.4	1.5
Health Service Industry	84.0	2.74	136.6	3.90	215.5	5.30	4.8	5.0	4.7
Hospitals	51.3	1.68	92.8	2.65	140.8	3.46	5.2	6.1	4.3
Other Health Services	32.7	1.07	43.8	1.25	74.7	1.84	4.2	2.9	5.8

Source: United States and Ohio health service industry data for 1950 and 1960 from Prindle, R., and M. Y. Pennell, "1960 Industry and Occupation Data," Health Manpower Source Books, Section 17 (Washington: U.S. Department of Health, Education, and Welfare, Public Health Service, 1963) Table 4, p. 9; Table 6, p. 13; Tables 13-A to 13-C, pp. 23-25. 1970 Ohio data from Ohio Fourth Count Summary Tape, 1970 Census of Population; 1970 data for the United States computed from U.S. Bureau of the Census, 1970 Census of Population, General Social and Economic Characteristics, Series PC(1)-C, U.S. Summary, Table 92.

considerable similarity in the structure and pattern of change between Ohio and the nation to suggest that roughly similar forces are acting to produce changes in each. The pattern and rate of change, in particular, are sufficiently related to suggest this possibility, e.g., if one divides Ohio's employment growth rates into the decennial rates for the nation, the resulting quotients are, with few exceptions, one or very close to one.[2] This implies, in the aggregate, that Ohio's "elasticity" or sensitivity to change with respect to national changes is close to unity; this fact shall have important implications later on, and we shall return to it.

Quite apart from general magnitudes, it is of interest to examine the characteristics of those employed in the health service industry. This is extraordinarily difficult to do because of the absence of appropriate data, but enough can be gleaned from available statistics to make the following general comments. To begin with, (and by definition) not all of those employed in the health service industry are in health-related occupations as defined earlier. The U.S. Department of Labor estimates, indeed, that somewhat less than 60 per cent of the total number of persons are employed in such occupational functions.[3] The remaining 40 per cent are employed in managerial, clerical, craft, and operative jobs. An illustration is that almost as many persons perform specific clerical functions as persons working as professional and practical nurses combined. The scanty evidence that is available suggests

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[2] See Table II.7 below.

[3] U.S. Department of Labor, Bureau of Labor Statistics, loc. cit., Vol. IV.

that roughly the same situation obtains in the health service industry in Ohio.

Secondly, and perhaps more importantly, females constitute, by a wide margin, the majority of this industry's work force both nationally and in Ohio. Indeed, as Table II.2 shows, not only is the female percentage of health service industry employment substantial, but it has been increasing over time. In 1950, for example, two-thirds of Ohio's employment in this industry was female; by 1970 that had risen to almost 78 percent of the total. Similar but somewhat smaller percentages can be seen for the nation. The importance of all of this should not be underestimated. The reason is that labor markets which are predominately female operate differently than those which have the opposite sex ratio. In general terms, these markets tend to be characterized by lower than average wages and salaries, and higher than average labor force turnover and attrition. Among other things, such conditions tend to place greater pressure upon educational institutions, the principal source of supply for new entrants into the labor market, as well as raising the total cost of training an appropriately skilled work force.

Apart from these aforementioned characteristics of health service industry employment at the state and national level, it is also important to examine the variations within the State of Ohio. The reason is that the health service industry is predominantly and increasingly an urban industry. Table II.3 and II.4, for example, show the regional and county variations throughout the State in 1970.[4] As can be seen, there are

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[4]As can be seen, regions have been defined simply as aggregates of counties. The county definition of the various regions roughly approximate the eleven local ("B") Comprehensive Health Planning Areas as reported by the Office of Comprehensive Health Planning, Ohio Department of Health. Since a few counties have not yet been federated into health planning areas, we arbitrarily assigned them to contiguous regions.

Table II.2

Health Service Industry Employment: Proportion Female
United States and State of Ohio
1950-1970

Area and Industry Division	Percent Female		
	1950	1960	1970
United States			
Health Service Industry	64.5	69.7	74.6
Hospitals	71.6	74.9	77.1
Other Health Services	54.3	60.3	70.2
State of Ohio			
Health Service Industry	67.6	72.6	77.6
Hospitals	76.5	78.6	80.2
Other Health Services	53.6	60.1	72.7

SOURCE: Ibid.

Table II.3

Total Employment and Health Service Industry Employment, by Region and County
State of Ohio. 1970

Region and County	Employed Population 16 years & over				Health Service Employment as percent of Total Employment
		Health Service Industry			
	Total, All Industries	Total	Hospitals	Other Medical & Health Services	
TOTAL, STATE OF OHIO	4,063,780	215,536	140,846	74,690	5.3
Region I (Northwest)	378,980	20,815	13,300	7,515	5.5
Defiance	13,817	586	316	270	4.2
Erie	28,834	1,781	1,209	572	6.2
Fulton	12,636	460	188	272	3.6
Henry	10,116	318	96	222	3.1
Huron	18,696	750	380	370	4.0
Lucas	188,815	12,187	8,341	3,846	6.4
Ottawa	13,272	490	257	233	3.7
Sandusky	22,419	937	528	409	4.2
Seneca	22,424	1,512	928	584	6.7
Williams	13,007	546	263	283	4.2
Wood	34,944	1,248	794	454	3.6
Region II (Greater Ottawa Valley)	162,359	7,688	4,759	2,929	4.7
Allen	42,502	2,772	1,924	848	6.5
Auglaize	15,014	531	310	221	3.5
Crawford	19,817	895	503	392	4.5
Hancock	24,251	1,099	647	452	4.5
Hardin	11,169	552	373	179	4.9
Mercer	13,310	428	210	218	3.2
Paulding	6,551	242	162	80	3.7
Putnam	10,427	323	179	144	3.1
Van Wert	11,165	459	321	138	4.1
Wyandot	8,153	387	130	257	4.7
Region III (Greater Miami Valley)	377,777	17,884	11,428	6,456	4.7
Clinton	11,813	459	332	127	3.9
Darke	18,807	809	343	466	4.3
Greene	45,991	1,755	875	880	3.8
Miami	33,300	1,329	783	546	4.0
Montgomery	239,831	12,640	8,659	3,981	5.3
Preble	13,176	446	182	264	3.4
Shelby	14,859	446	254	192	3.0
Region IV (Central Ohio River Valley)	528,125	30,015	19,266	10,749	5.7
Adams	5,714	305	217	88	5.3
Brown	8,847	359	228	131	4.1
Butler	83,800	3,747	2,428	1,319	4.5
Clermont	34,769	889	440	449	2.6
Hamilton	353,757	23,336	15,349	7,987	6.6
Highland	10,255	424	225	199	4.1
Warren	30,983	955	379	576	3.1

Table II.3 (cont.)

Region and Country	Employed Population 16 years & over				Health Service Employment as percent of Total Employment
	Total, All Industries	Health Service Industry			
		Total	Hospitals	Other Medical & Health Services	
Region V (Mid-Ohio)	642,569	34,335	21,451	12,884	5.3
Champaigne	12,055	374	204	170	3.1
Clark	58,603	3,145	1,848	1,297	5.4
Delaware	17,041	683	370	313	4.0
Fairfield	27,178	957	345	612	3.5
Fayette	9,509	467	268	199	4.9
Franklin	336,132	19,178	12,074	7,104	5.7
Knox	16,010	1,239	857	382	7.7
Licking	39,535	1,329	650	679	3.4
Logan	13,258	592	378	214	4.5
Madison	10,403	503	310	193	4.8
Marion	24,365	1,119	676	443	4.6
Morrow	7,884	310	227	83	3.9
Pickaway	13,269	694	476	218	5.2
Pike	4,879	226	133	93	4.6
Ross	20,211	1,817	1,523	294	9.0
Scioto	23,112	1,282	904	378	5.5
Union	9,125	420	208	212	4.6
Region VI (Cleveland Area)	923,970	50,244	34,308	15,936	5.4
Cuyahoga	695,800	40,116	28,243	11,873	5.8
Geauga	23,807	1,114	601	513	4.7
Lake	77,766	2,722	1,695	1,027	3.5
Lorain	95,385	4,898	2,996	1,902	5.1
Medina	31,212	1,394	773	621	4.5
Region VII (Mahoning Valley)	275,671	13,886	9,051	4,835	5.0
Ashtabula	36,562	1,203	622	581	3.3
Columbiana	39,624	1,749	1,050	699	4.4
Mahoning	111,150	6,475	4,297	2,178	5.8
Trumbull	88,335	4,459	3,082	1,377	5.0
Region VIII (North East Ohio)	287,713	14,507	8,851	5,656	5.0
Ashland	17,522	649	356	293	3.9
Carroll	7,718	176	61	115	2.3
Holmes	7,673	355	126	229	4.6
Richland	50,945	2,221	1,315	906	4.4
Stark	141,260	7,959	5,243	2,716	5.6
Tuscarawas	27,701	1,249	616	633	4.5
Wayne	34,894	1,898	1,134	764	5.4

Table II.3 (cont.)

Region and County	Employed Population 16 years & over				Health Service Employment as percent of Total Employment
	Total, All Industries	Health Service Industry			
		Total	Hospitals	Other Medical & Health Services	
Region IX (Ohio Valley)	66,720	4,440	3,488	952	6.6
Athens	18,295	1,300	1,078	222	7.1
Gallia	7,546	1,460	1,351	109	19.3
Hocking	6,680	275	204	71	4.1
Jackson	8,186	307	152	155	3.7
Lawrence	17,593	724	459	265	4.1
Meigs	5,710	276	206	70	4.8
Vinton	2,710	98	38	60	3.6
Region X (Portage-Summit)	260,063	13,442	9,212	4,230	5.2
Portage	47,306	1,804	1,123	681	3.8
Summit	212,757	11,638	8,089	3,549	5.5
Region XI (Southeastern Ohio)	159,833	8,280	5,732	2,548	5.2
Belmont	28,159	1,593	1,082	511	5.7
Coshocton	12,342	460	302	158	3.7
Guernsey	13,138	1,351	1,125	226	10.3
Harrison	5,849	189	51	138	3.2
Jefferson	32,618	1,770	1,321	449	5.4
Monroe	4,591	79	32	47	1.7
Morgan	3,746	107	36	71	2.9
Muskingum	27,940	1,573	1,168	405	5.6
Noble	3,355	51	9	42	1.5
Perry	8,452	216	84	132	2.6
Washington	19,643	891	522	369	4.5

SOURCE: Ohio Fourth Count Summary Tape, 1970 Census of Population.

Table II.4

Regional Distribution of Total Employment and Health Service Industry Employment, State of Ohio, 1970

Region[a]	Employed Population 16 years & over			
	All Industries		Health Service Industry	
	Number	Percent	Number	Percent
TOTAL, STATE OF OHIO	4,063,788	100.0	215,536	100.0
Region I	378,980	9.3	20,815	9.7
Region II	162,359	4.0	7,688	3.6
Region III	377,777	9.3	17,884	8.3
Region IV	528,125	13.0	30,015	13.9
Region V	642,569	15.8	34,335	15.9
Region VI	923,970	22.7	50,244	23.3
Region VII	275,671	6.8	13,886	6.4
Region VIII	287,713	7.1	14,507	6.7
Region IX	66,720	1.6	4,440	2.1
Region X	260,063	6.4	13,442	6.2
Region XI	159,833	3.9	8,280	3.8

[a] As defined in Table II.3.

SOURCE: Ibid.

substantial variations at the level of the county, ranging from less than one percent of total employment accounted for by health service employment to almost 20 percent. This is to some extent, however, a statistical mirage, for obviously health service marketing areas extend beyond county borders. Nonetheless, some variation continues to be apparent when one aggregates, as we have in Table II.4, the counties into regional units. Since these regions approximate marketing areas, the discrepancy between the percent of total employment and percent of health service industry employment for most regions is somewhat stronger evidence that health services are not equally available to the population throughout the State. The disparities between the Cleveland area and the southeastern part of the State are cases in point.

More important perhaps is that the health service industry is highly concentrated in the large urban or metropolitan centers of the State, somewhat out of proportion to the concentrations of population in these areas. For instance, the six largest counties which comprised the cores of the major Standard Metropolitan Statistical Areas (SMSA) in Ohio in 1970 accounted *in toto* for about 48 percent of total population but more than 55 percent of the total health service industry employment in the State. The three largest SMSA's *per se* accounted for about 38 percent of the population but 43 percent of the total health service employment. Thus, while the relative figures show only slight variations, it seems clear that in absolute terms, the industry is heavily concentrated in metropolitan areas. This fact, as others

mentioned above, will become important later on; we shall also return to them at that point.

THE DIVISION OF LABOR

Of greater interest than the sectoral distribution of employment, of course, is the occupational structure of the health manpower stock. Since the health service industry as defined by the Census does not account for total employment in health-related occupations, we switch our focus in the remainder of this section to examine the occupational characteristics of health workers. As suggested earlier, this task proved to be extraordinarily difficult, principally as a function of inadequate statistics, and we had to resort to rather crude estimating procedures to obtain even a rough statistical picture of trends both at the national and local levels. The figures are, nonetheless, consistent in our judgment, and viewed as a whole, provide insights that would not be possible in their absence. Having said this, we examine both the occupational composition of Ohio's health manpower in relation to the nation and within its own borders.

In 1970, about 148,000 persons were employed in health-related occupations in the State of Ohio. Since the definition of "health-related" is narrowly interpreted as a function of the data source,[5] this is a conservative estimate; one, indeed, that may be considered the effective minimum. More important than the absolute number is that some 83 percent of all health personnel were allied health workers, as defined previously. Within the allied category, somewhat less than half were skilled workers and the remainder, semi-skilled health personnel.

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[5] See Section I above.

Table II.5 provides a first overview of the relative historical situation by showing the numbers employed in health occupations in the State of Ohio over the period 1950-1970. As can be seen, the absolute number of health personnel more than doubled over the period and structural characteristics of the stock changed substantially, principally away from higher skilled or trained personnel toward those with less formal training. For instance, while the core practitioner category accounted for almost 30 per cent of all employed health-related personnel in 1950, it accounted for less than a fifth of the total in 1970. On the other hand, the proportion of semi-skilled health workers grew from a little more than 20 per cent of the stock in 1950 to more than 40 per cent in 1970. Of significance is that the most rapidly growing component of the health manpower stock is the semi-skilled allied worker. This fact implies among other things a substantial change in the ways in which the health service delivery system operates.

Now an important question is the extent to which health manpower employment in Ohio is similar to the overall national employment pattern in these occupations. In the first instance, such a comparison can be made with respect to the ratio between health manpower and total population. On this basis, Ohio's situation is somewhat less favorable than the nation's. For instance, in 1970 Ohio had 1,389 employed health workers per 100,000 population, while the national average for the same year was 1,439 per 100,000. This discrepancy was roughly of the same magnitude for each of the major components of the health manpower stock; e.g., the national rates of core and skilled allied personnel per 100,000 population were 265 and 593 respectively, while the Ohio rates were 245 and 557 respectively. Given the fact that

Table II.5

Estimated Employment in Health Occupations, State of Ohio

1950-1970

(In Thousands)

Health Occupations	Estimated Number of Employed Persons					
	1950		1960		1970	
	Number (000)	Percent	Number (000)	Percent	Number (000)	Percent
TOTAL EMPLOYMENT, ALL HEALTH OCCUPATIONS	68.7	100.0	103.5	100.0	147.8	100.0
Core Practitioners	20.4	29.7	23.4	22.6	26.1	17.7
Physicians, including Osteopaths	10.0	14.6	12.2	11.8	14.2	9.6
Dentists	3.7	5.4	4.1	4.0	4.4	3.0
Pharmacists[a]	4.2	6.1	4.3	4.1	4.5	3.1
Other Core Practitioners[b]	2.5	3.6	2.8	2.7	3.0	2.0
Allied Health Personnel: Skilled	26.2	38.1	39.6	38.3	59.3	40.1
Dieticians and Nutritionists	1.3	1.9	1.4	1.3	1.5	1.0
Health Technologists and Technicians[c]	4.0	5.8	7.5	7.3	14.6	9.9
Professional Nurses	20.2	29.4	29.7	28.7	41.0	27.7
Therapists and Therapy Assistants[d]	0.7	1.0	1.0	1.0	2.2	1.5
Allied Health Personnel: Semi-skilled	22.1	32.2	40.5	39.1	62.4	42.2
Practical Nurses	6.4	9.3	11.6	11.2	16.5	11.2
Nursing Aides, Assistants, and Attendants[e]	11.6	16.9	22.2	21.4	28.0	18.9
Other Semi-skilled Personnel[f]	4.1	6.0	6.7	6.5	17.9	12.1

a. Figures exclude those who perform full-time managerial/proprietary functions.

b. Includes chiropractors, optometrists, podiatrists, and veterinarians. 1950 and 1960 figures include the estimated number of employed podiatrists; these estimates are not based on Census materials.

c. Includes chemical laboratory technologists and technicians; dental hygienists and technicians; health record technologists and technicians; radiology technologists and technicians; and health technologists and technicians, n.e.c. Census data on "Medical and Dental Technicians" for 1950 and 1960 were adjusted to include estimated number of employed health record technicians and technologists.

d. Includes occupational therapists, physical therapists, speech and hearing therapists, other therapists, n.e.c., and therapy assistants. Census data on "Therapists and Healers, n.e.c." for 1950 and 1960 were adjusted to exclude podiatrists, and eclectic doctors, faith healers, naturopaths and related workers.

e. Includes only those persons employed in hospitals and other institutions.

f. Includes dental and medical assistants, health trainees, and midwives. Census data for 1950 and 1960 were adjusted to include student professional nurses.

SOURCE: Data for 1950 and 1960 computed from U.S. Bureau of the Census, U.S. Census of Population, 1960, Vol. 37 Ohio, Table 120, pp. 635-40. The 1970 totals for Core, Allied: Skilled, and Allied: Semi-skilled are from the Fourth Count Summary Tape, 1970 Census of Population; detailed occupational categories within each total were estimated from employment and registry information obtained from the State of Ohio and/or cited in U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, Health Resources Statistics, 1971 (Rockville, MD.: The Department, 1972), selected Tables, pp. 57-270. See text for a discussion of estimating procedures.

Ohio is more densely populated and urbanized than most States and allowing for the possibility that such factors can affect health manpower productivity however, it is doubtful that these are significant differences. Indeed, it is plausible to argue that the per capita availability of health manpower in Ohio is no better and no worse than it is in most areas of the country.

More important, in our judgment, is the extent to which health-related employment in Ohio has changed over time relative to the change experienced elsewhere in the nation. This is an important question, because it raises the implicit issue of the extent to which national trends penetrate and influence employment trends in Ohio. At best, this is a tricky question to answer, and the available data preclude little more than a preliminary look-see. We have, nonetheless, compared the absolute and relative changes which have occured over the past two decades in Ohio and the United States, and this provides a few important insights. Tables II.6 and II.7 display these computations.[6]

In very broad terms, as can be seen, the pattern of change in Ohio relative to the United States has been remarkably similar, particularly in terms of the relative or proportional structure of the stock of persons employed in health occupations: the percentage of the stock at both levels accounted for by core personnel was about 30 per cent in 1950 and 18 per cent in 1970. There are slight variations in the skill mix of the allied component, principally in terms of Ohio's slightly lower

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[6]There are slight discrepancies between the Ohio data reported in this Table and in Table II.5. These differences stem from the fact that adjustments were not made in the national employment data. Since the national/State analysis required strict comparability, we show the census information as reported for both Ohio and the United States.

Table II.6

Employment in Core and Allied Health Occupations
United States and the State of Ohio
1950-1970

Area and Occupational Categories	Number of Employed Persons						Annual Average Growth Rate		
	1950		1960		1970		1950-1960	1960-1970	1950-1970
	Number	Percent	Number	Percent	Number	Percent			
United States	1,350,703	100.0	1,969,351	100.0	2,924,081	100.0	3.8	4.0	3.9
Core Practitioners[a]	402,310	29.8	453,207	23.0	538,746	18.4	1.2	1.7	1.4
Allied, Total	948,393	70.2	1,516,144	77.0	2,385,335	81.6	4.8	4.6	4.7
Skilled[b]	523,966	38.8	783,314	39.8	1,204,822	41.2	4.1	4.4	4.2
Semi-skilled[c]	424,427	31.4	732,830	37.2	1,180,513	40.4	5.6	4.9	5.3
STATE OF OHIO	68,550	100.0	102,761	100.0	147,831	100.0	4.1	3.7	3.9
Core Practitioners[a]	20,021	29.2	22,872	22.3	26,107	17.7	1.4	1.4	1.4
Allied, Total	48,529	70.8	79,889	77.7	121,724	82.3	5.1	4.3	4.7
Skilled[b]	26,398	38.5	39,407	38.3	59,292	40.1	4.1	4.2	4.1
Semi-skilled[c]	22,131	32.3	40,482	39.4	62,432	42.2	6.2	4.4	5.3

a. Includes chiropractors; dentists; optometrists; pharmacists; physicians, including osteopaths; veterinarians; and other practitioners, n.e.c.

b. Includes dieticians and nutritionists; professional nurses; medical and dental technicians and technologists, and therapists and healers, n.e.c.

c. Includes attendants and aides in hospitals and other institutions; attendants and aides in physician's and dentist's offices; practical nurses and midwives; and health trainees. Data for 1950 and 1960 adjusted to include student nurses.

SOURCE: Ohio data, ibid; United States data for 1950 and 1960 computed from Prindle and Pennell, loc. cit. Selected Tables, pp.31-95; United States data for 1970 computed from U.S. Bureau of the Census, 1970 Census of Population, General Social and Economic Characteristics Series PC(1)-C. U.S. Summary, Table 91.

Table II.7

Health Manpower Employment Elasticities[a], by Industry Division and Occupational Category
United States and the State of Ohio
1950-1970

Occupational Category, Industry Division and Area	Employment Elasticities		
	1950-1960	1960-1970	1950-1970
Health Service Industry Employment			
U.S. Total/Ohio Total	1.111	0.922	1.000
U.S. Hospital/Ohio Hospital	1.109	0.896	1.020
U.S. Other Medical Service/Ohio Other Medical Service	1.036	1.017	1.000
Employment in Health Occupation			
U.S. Total/Ohio Total	1.079	0.925	1.000
U.S. Core Practitioners/Ohio Core Practitioners	1.167	0.823	1.000
U.S. Skilled Allied/Ohio Skilled Allied	1.000	0.954	0.976
U.S. Semi-Skilled Allied/ Ohio Semi-skilled Allied	1.107	0.898	1.000

a. Approximated by dividing the average annual growth rates of health-related employment in Ohio by the annual average growth rates of health-related employment in the United States.

SOURCE: Computed from Table II.1 and II.6.

proportion of skilled allied personnel. This implies the probablility that the average amount of training per employed person in health occupations in Ohio is slightly lower than the national average. On the whole, however, the patterns over the twenty year period are very close. As before, if one examines relative growth rates, the resulting "elasticity" coefficients are all quite close to unity as shown in Table II.7.

Given this general conclusion, however, it is worth pointing out that the time paths during the period 1950-1970, i.e., the paths represented by the period 1950-1960 and then 1960-1970 differ as between Ohio and the United States. The decennial breakdown in Table II.6, for example, shows that the growth in each of the components of the manpower stock in Ohio was somewhat faster than the United States in the decade of the 'fifties, while the opposite was true in the decade of the 'sixties. Note in particular the similarity of the growth rates between Ohio during 1950-1960 and the United States during the period 1960-1970. Interpreting this difference is not altogether easy; but one plausible explanation is that Ohio has been, from a technological point of view, a trendsetter; perhaps moving into new areas somewhat sooner than the nation as a whole. Over longer time periods, however, the nation "catches up", suggesting the possibility that roughly the same forces tend to shape the manpower structure in the health field, but at differential rates in time.

It may be legitimate at this juncture, then, to raise the question of the kinds of forces likely to be shaping the trends in the utilization of various types of manpower. Unfortunately, little in the way of concrete evidence or documentation can be brought to bear upon such a question, for stemming again from the absence of reasonably detailed

data as well as perhaps scholarly interest, very little truly is known or understood about the dynamics of the health care market and thereby the utilization of various categories of health manpower. Clearly, changes in population and income affect the demand for health services and thereby the employment of health personnel. But it is more likely that changes in the supply conditions under which health services are produced have had even a greater impact, particularly from the point of view of allied manpower. Such major supply related factors include: technological change, substitution for skills in short supply, and shifts in the utilization of services resulting from changes in public policy. None of these factors, needless to say, can be discussed in detail at this point, but it may be worth setting forth a set of brief generalizations about them.

In the first place, it seems clear that technical advances per se and their diffusion throughout the medical care field have created the emergence and utilization of substantial numbers of specialized health skills: new diagnostic and monitering equipment, rehabilitative techniques and the like have been developed and introduced into the field at very rapid rates, and this has helped to forge literally a host of new occupational titles and functions. Circulation technology and inhalation therapy are simple cases in point. Secondly, it seems plausible to assume that lesser skilled persons have been substituted for more highly skilled ones, especially those highly trained persons who have been in (or presumed to be in) short supply. Indeed, given the pressure of increased demands for health care on the one hand, and constraints in the supply of key personnel on the other, it appears that the "production" of health services is being re-organized so that job functions are

divided and responsibility delegated to more and more persons.

Or so it appears. What is difficult to assess is the extent to which pressures of inadequate supplies of skilled manpower (such as the physician) have been translated into a modification of the manpower structure or in the reduction of the quantity or quality of health care services. The division of labor, for instance, has been limited to some point by the existence of licensure regulations as well as the constraints of professional perogative, although it is difficult to ascertain precisely where this point lies. Furthermore, to utilize the trend data above as evidence of substitution efforts requires, strictly speaking, an assumption that the mix of health care services (to the total) remained constant throughout the period. Available evidence suggests, of course, that this was hardly true over the period, casting some doubt then on the extent to which forced substitution effects may account for changes in the manpower structure.

Finally, it should be noted that recent changes in public policy in the health care area, particularly at the Federal level, may also account for changes in the health manpower structure. It is clear, for instance, that some impetus has resulted in Say-like fashion[7] from programs designed to increase the supply of health manpower such as the Allied Health Profession Personnel Training Act of 1966 and the Comprehensive Health Manpower Training Act of 1971. More important, however, is that programs such as Medicare and Medicaid have not only increased the demand for service but also contributed substantially to cementing the drift of

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[7]Say was a nineteenth century economist who argued that supply creates its own demand.

health care to be centralized more and more in a hospital setting.[8] The impact of this movement is simply that the utilization of specialized skills is very likely facilitated in such an institutional framework. The extent to which this movement is expanded or restricted, then, may well influence the accumulative trend toward specialized job functions.

As will be seen shortly, the importance of the foregoing is that projections of future manpower requirements depend heavily upon the interpretation of past trends and the relative importance attached to the combination of factors responsible for such trends. No firm interpretation is possible, however, in the absence of specific research into the question, and we can do little more at present than to make certain assumptions about such change. The nature of these assumptions will be spelled out below.

HEALTH MANPOWER IN OHIO: DETAILED CHARACTERISTICS

In an effort to provide somewhat greater detail about the health manpower situation in Ohio, this section examines (to the extent permitted by the data) both the detailed occupational and geographical distribution of the health manpower stock in Ohio. This task proved to be extremely difficult, and we have not accomplished all that we set out to do. Nonetheless, some sense of the situation has been obtained, and we report it in the remainder of this section.

We suggested earlier that it is possible to count upwards of 100 occupational titles in the health field at present. It would, of course,

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[8] C.f. Anne Somers, Health Care in Transition: Directions for the Future, (Chicago: Hospital Research and Educational Trust, 1971), especially Chapter 3.

be useful to be able to categorize the employment of health manpower in such detail, but this is not possible, even at the national level. We have, however, prepared estimates of the numbers employed in some greater detail than the figures shown above for that portion of the total stock in which we are interested, allied health manpower. These estimates are presented in Table II.8.

As can be seen, we estimate that the sixteen occupations shown represent about 90 per cent of the total stock of allied personnel. Of greater interest is that the vast majority of these workers are accounted for by personnel providing nursing services, registered nurses accounting for more than a third of the total and a little less than half of the nursing category. Although no other single group accounts for anywhere near this proportion, it is well to bear in mind that most of the technologist and technician jobs hardly existed a few decades ago, and several thousand persons employed in such functions represent a sizable increase over time. A similar point may be made about employment in the therapy and therapy aides categories. As we shall see, these types of manpower are expected to grow substantially in the late seventies and early 'eighties.

Apart from the number and type of personnel employed in the State as a whole, it is instructive to examine (to the extent possible) the regional variation of the personnel employed in health occupations within the State as well as changes in that distribution over time. Such analysis must of neccessity be relatively aggregate in nature, but even at that, the premise that health manpower employment is essentially an urban phenomenon again emerges.

Table II.8

Estimated Employment in Selected Allied Health Occupations
State of Ohio, 1970

Selected Allied Occupations	Estimated Number of Persons Employed	
	Number	Percent
TOTAL, ALL ALLIED OCCUPATIONS	121,724	100.0
TOTAL, SELECTED ALLIED OCCUPATIONS	110,425	90.7
Dieticians, Nutritionists, and Dietetic Technicians	1,500	1.2
Dental Hygienists	900	0.7
Dental Laboratory Technicians	1,100	0.9
Dental Assistants	4,500	3.7
Health and Hospital Librarians & Related	500	0.4
Health and Medical Record Technicians, Assistants, & Aides	2,500	2.0
Medical and Medical Laboratory Technologists	2,800	2.3
Medical and Medical Laboratory Technicians, Assistants & Related	2,300	1.9
Nurses, Registered	41,000	33.7
Nurses, Practical	16,500	13.6
Nursing Aides, Orderlies & Attendants	28,000	23.0
Radiology Technologists, Technicians, & Assistants	4,600	3.8
Technicians and Technologists, n.e.c.	2,000	1.6
Therapists, Occupational and Physical	925	0.8
Therapists, Other Specialities n.e.c.	600	0.5
Therapy Assistants and Technicians	700	0.6

SOURCE: See Table II.5.

We begin by showing in Table II.9 employment in major health occupational categories in the regions and counties of Ohio in 1970. As a summary measure, we also show in this Table the proportion of total health employment accounted for by core practitioners. In general terms, this proportion may be considered a crude indicator of the extent to which allied personnel may be substituted for core personnel who are in short supply and thereby the technology utilized in producing health services. If this indicator is representative, one would expect to find not only variation among different regions and counties, but also somewhat higher proportions of core personnel to the total in more densely populated, urbanized areas. As can be seen, both such variation and the expected direction of that variation is in evidence in Table II.9. The proportion of core practitioners to the total (or inversely the proportion of allied workers to the total) ranges from about 3 percent (ninety-seven) to more than a third (two-thirds). In most instances the larger, urbanized regions and counties show substantially higher proportions than do the more rural areas of the State. Note, for instance, the rates for Cuyahoga, Hamilton and Franklin counties.

This variation may perhaps be more easily seen in the tabular summary given in Table II.10, for here we show, in part, the regional distribution of employment in health occupations by general category. If the distribution of personnel was random and if the technological and/or organizational conditions under which health services were produced were identical throughout the State, one would expect to find nearly identical percentages in this tabular presentation along horizonal lines. As is clear, this result is not found, the variation again

TABLE II.9

Employment in Health Occupations by Region and County
State of Ohio, 1970

Region and County	Persons Employed in Health Occupations				Core Practitioner as Percent of Total Health Occupations
	Total	Core Practitioners	Allied Personnel: Skilled	Allied Personnel: Semi-skilled	
TOTAL, STATE OF OHIO	147,831	26,107	59,292	62,432	17.6
Region I (Northwest Ohio)	14,412	2,230	5,788	6,394	15.5
Defiance	396	62	140	194	15.7
Erie	1,164	127	438	599	10.9
Fulton	285	35	103	147	12.3
Henry	261	35	114	112	13.4
Huron	611	108	222	281	17.7
Lucas	8,275	1,409	3,443	3,423	17.0
Ottawa	298	66	82	150	22.1
Sandusky	687	85	291	311	12.4
Seneca	986	114	319	553	11.6
Williams	430	61	163	206	14.2
Wood	1,019	128	473	418	12.6
Region II (Greater Ottawa Valley)	5,273	820	2,158	2,295	15.6
Allen	1,777	229	796	752	12.9
Auglaize	365	86	110	169	23.6
Crawford	667	85	272	310	12.7
Hancock	769	100	351	318	13.0
Hardin	396	94	125	177	23.7
Mercer	317	69	134	114	21.8
Paulding	165	48	63	54	29.1
Putnam	248	28	112	108	11.3
Van Wert	288	47	106	135	16.3
Wyandot	281	34	89	158	12.1
Region III (Greater Miami Valley)	12,433	2,054	5,254	5,125	16.5
Clinton	350	65	125	160	18.6
Darke	529	66	157	306	12.5
Greene	1,190	197	598	395	16.6
Miami	956	123	426	407	12.9
Montgomery	8,766	1,499	3,689	3,578	17.1
Preble	332	51	111	170	15.4
Shelby	310	53	148	109	17.1
Region IV (Central Ohio River Valley)	20,411	3,931	7,827	8,653	19.3
Adams	254	9	62	183	3.5
Brown	269	43	94	132	16.0
Butler	2,640	336	1,124	1,180	12.7
Clermont	600	101	221	278	16.8
Hamilton	15,622	3,257	6,027	6,338	20.8
Highland	291	49	81	161	16.8
Warren	735	136	218	381	18.5

Table II.9 (cont.)

Region and County	Persons Employed in Health Occupations: Total	Core Practitioners	Allied Personnel: Skilled	Allied Personnel: Semi-skilled	Core Practitioner as Percent of Total Health Occupations
Region V (Mid-Ohio)	24,210	4,444	9,943	9,823	18.4
Champaign	278	29	93	156	10.4
Clark	2,167	277	769	1,121	12.8
Delaware	476	96	192	188	20.2
Fairfield	705	123	233	349	17.5
Fayette	306	25	90	191	8.2
Franklin	13,692	2,946	6,172	4,574	21.5
Knox	769	43	276	450	5.6
Licking	927	200	383	344	21.6
Logan	442	78	214	150	17.6
Madison	351	35	101	215	10.0
Marion	784	156	303	325	19.9
Morrow	221	8	63	150	3.6
Pickaway	526	90	189	247	17.1
Pike	167	15	47	105	9.0
Ross	1,123	137	359	627	12.2
Scioto	955	152	366	437	15.9
Union	321	34	93	194	10.6
Region VI (Cleveland)	33,921	6,869	13,774	13,278	20.2
Cuyahoga	27,048	5,891	11,036	10,121	21.8
Geauga	689	145	281	263	21.0
Lake	1,734	262	804	668	15.1
Lorain	3,506	439	1,304	1,763	12.5
Medina	944	132	349	463	14.0
Region VII (Mahoning Valley)	9,495	1,647	3,894	3,954	17.3
Ashtabula	927	169	312	446	18.2
Columbiana	1,213	181	493	539	14.9
Mahoning	4,316	671	1,877	1,768	15.5
Trumbull	3,039	626	1,212	1,201	20.6
Region VIII (Northeastern Ohio)	10,189	1,437	3,832	4,920	14.1
Ashland	518	51	235	232	9.8
Carroll	150	15	74	61	10.0
Holmes	216	54	17	145	25.0
Richland	1,479	264	515	700	17.8
Stark	5,652	763	2,123	2,766	13.5
Tuscarawas	821	112	378	331	13.6
Wayne	1,353	178	490	685	13.2

Table II.9 (cont.)

Region and County	Persons Employed in Health Occupations				Core Practitioner as Percent of Total Health Occupations
	Total	Core Practitioners	Allied Personnel: Skilled	Allied Personnel: Semi-skilled	
Region IX (Ohio Valley)	2,872	287	992	1,593	10.0
Athens	876	62	317	497	7.1
Gallia	845	81	231	533	9.6
Hocking	188	31	73	84	16.5
Jackson	207	19	76	112	9.2
Lawrence	517	55	228	234	10.6
Meigs	155	11	59	85	7.1
Vinton	84	28	8	48	33.3
Region X (Summit-Portage)	9,014	1,652	3,776	3,586	18.3
Portage	1,267	182	591	494	14.4
Summit	7,747	1,470	3,185	3,092	19.0
Region XI (Southeastern Ohio)	5,601	736	2,054	2,811	13.1
Belmont	1,030	164	420	446	15.9
Coshocton	325	70	95	160	21.5
Guernsey	960	81	191	688	8.4
Harrison	147	26	52	69	17.7
Jefferson	1,187	114	520	553	9.6
Monroe	63	6	23	34	9.5
Morgan	67	11	17	39	16.4
Muskingum	989	127	418	444	12.8
Noble	33	10	0	23	30.0
Perry	165	41	61	63	24.8
Washington	635	86	257	292	13.5

SOURCE: Ohio Fourth Count Summary Tape, 1970 Census of Population.

Table II.10

Regional Distribution of Population and Employment in Health Occupations
State of Ohio, 1970

Region[a]	Total Population		Persons Employed in Health Occupations							
			Total		Core Practioners		Allied, Skilled		Allied, Semi-skilled	
	Number (000)	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
TOTAL, STATE OF OHIO	10,652.0	100.0	147,831	100.0	26,107	100.0	59,292	100.0	62,432	100.0
Region I	989.1	9.3	14,412	9.8	2,230	8.5	5,788	9.7	6,394	10.2
Region II	428.9	4.0	5,273	3.6	820	3.1	2,158	3.6	2,295	3.7
Region III	968.6	9.1	12,433	8.4	2,054	7.9	5,254	8.9	5,125	8.2
Region IV	1,405.5	13.2	20,411	13.8	3,931	15.1	7,827	13.2	8,653	13.9
Region V	1,682.7	15.8	24,210	16.4	4,444	17.0	9,943	16.8	9,823	15.7
Region VI	2,321.0	21.8	33,921	22.9	6,869	26.3	13,774	23.2	13,278	21.3
Region VII	742.6	7.0	9,495	6.4	1,647	6.3	3,894	6.5	3,954	6.3
Region VIII	754.5	7.1	10,189	6.9	1,437	5.5	3,832	6.5	4,920	7.9
Region IX	213.7	2.0	2,872	1.9	287	1.1	992	1.7	1,593	2.5
Region X	679.2	6.4	9,014	6.1	1,652	6.3	3,776	6.4	3,586	5.7
Region XI	466.2	4.4	5,601	3.8	736	2.8	2,054	3.5	2,811	4.5

[a]As defined in Table II.3.

SOURCE: Population data from U.S. Bureau of the Census, 1970 Census of Population, General Population Characteristics, Ohio Advance Reports PC(V2)-37 Employment data from Ohio Fourth Count Summary Tape, 1970 Census of Population.

moving in the direction of more skilled persons in more urbanized areas.

An equally interesting and (indeed) traditional method of examining this variation is obtained by computing the relative population distribution and the distribution of persons employed in health occupations. Since there is a great variation in the specific health occupation/population ratios across the State, we show simply the proportion of population in each region and compare it to the relevant percentages (components and total) of health employment. To the extent that these proportions differ horizonally implies higher or lower manpower/population ratios. Again, as can be seen, there are indeed differences among the several regions, with substantially higher rates of skilled manpower per capita in more highly urbanized places than in more rural areas. The significance of this point as well as those made above will become evident in our discussion in a subsequent section of future manpower requirements.

Finally, let us examine as best we can the degree to which the regional distribution of health manpower has changed over time. We have pointed out earlier that there is evidence that health manpower is increasing located in metropolitan Ohio; Table II.11 indicates the extent of this trend. The State is, of course, highly urbanized: in 1970 more than three quarters of the population resided in urban places (as defined by the Census Bureau) and approximately 78 per cent resided in areas within Standard Metropolitan Statistical Areas (SMSA's). But even given this fact, the proportion of the health manpower stock (and the changes over time) working in SMSA's is extremely high. Note, for instance, that about 85 per cent of all core practitioners are employed in SMSA's as are more than 95 per cent of all skilled allied

Table II.11

Percentage Distribution of Health Manpower Employed in Standard Metropolitan Statistical Areas, by Occupational Categories, State of Ohio, 1960-1970

Occupational Category	Percentage of Total Number of Employed Persons				
	1960		1970[a]		Change 1960-1970
	Total	In SMSA	Total	In SMSA	
TOTAL, ALL HEALTH OCCUPATIONS	100.0	76.4	100.0	81.2	4.8
Core Practioners[b]	100.0	79.5	100.0	85.1	5.6
Physicians, including Osteopaths	100.0	83.5	100.0	86.1	2.6
Other Core Practioners	100.0	74.8	100.0	83.9	9.1
Allied Personnel, Skilled[b]	100.0	78.5	100.0	83.3	4.8
Registerd Nurses	100.0	77.7	100.0	77.7	0.0
Others n.e.c.	100.0	81.1	100.0	95.7	14.6
Allied Personnel, Semi-skilled[b]	100.0	72.1	100.0	77.5	5.4
Practical Nurses	100.0	70.7	100.0	81.6	10.9
Others, n.e.c.	100.0	72.8	100.0	76.1	3.3

a. In addition to those included in the 1960 definition of SMSA's, the 1970 definition includes the counties of Summit, Clermont, Warren, Medina, Geauga, Pickaway, Delaware, Preble, Van Wert, Putnam, Richland, and Wood.

b. As defined in Table II.6.

SOURCE: 1960 figures computed from U.S. Bureau of the Census, U.S. Census of Population, 1960, Vol. 37, Ohio, Table 121, pp. 647-664. The 1970 totals for Core, Allied: Skilled, and Allied: Semi-skilled are from the Ohio Fourth Count Summary Tape, 1970 Census of Population. Detail within these totals are estimates.

personnel, exclusive of nursing; these are the technologist and technician jobs that (as will be seen) will grow in such importance. The average proportion of core practitioners to the total manpower stock in the three largest SMSA's is 21 percent, while it is but 14 percent in the rest of the State. These figures are suggestive, then, of the concentration of skilled health workers in urban areas.

Comparisons of the locus of employment over time are difficult, not the least of the reason being that the definition of SMSA's has changed over the period 1960-1970. We have examined (although have not included) the trend over the period 1960-1970 using the 1960 definitions in both periods as well as using the differing 1960 and 1970 definitions as shown in Table II.11. While the magnitude of the change is somewhat less than that indicated in Table II.11, the direction is clearly the same. Since the county additions to the 1960 definitions mean that they are now economically and socially integrated with their respective central city cores, we have not reported the 1960 definition magnitudes. In either case, however, the conclusion is the same: increasing numbers of health personnel are located in large metropolitan centers. The implication is clear-- the important question is the extent to which the trend should be allowed to continue in the future. The next section of the paper study considers this question in greater detail.

III

OHIO'S REQUIREMENTS FOR ALLIED HEALTH MANPOWER IN THE 'EIGHTIES

Given the current number and types of personnel employed in health-related functions in Ohio as well as the changes that have taken place in this manpower pool over the past two decades, we come now to the more crucial question of the size and characteristics of the stock that will be required in the decade of the 'eighties. Recall our earlier discussion of the meaning of requirements as well as our emphasis upon employment conditions and prospects. Armed with these limited concepts, our goal in the present section is to assess both the likely requirements for and supply of allied health manpower in Ohio over the period 1970-1985. In the process, this section also provides rough estimates of the extent to which the existing education and training system is geared up to satisfy future requirements.

The analysis reported herein is predicated upon several crucial assumptions, one of which requires discussion at the outset. Specifically, we assume in the following that the requirements for allied health manpower in Ohio will be influenced, in large measure, by the same forces shaping the national demand for health manpower. This assumption stems, in part, from the results of the empirical analysis above, which showed that changes in Ohio have closely paralleled national changes and that the structure of health manpower employed in Ohio closely resembles the national structure. Furthermore, to the extent that major shifts in policy which affect either the supply of or

demand for health services (or both) are likely to be initiated at the Federal level, there is every reason to suppose that Ohio will respond to them in ways that roughly parallel the responses elsewhere in the country. For these reasons, we believe that it is possible to derive requirements for the State of Ohio from projections of national health manpower requirements. We have, in fact, hinged a substantial amount of the analysis upon projections of health-related employment requirements made by various groups at the national level; they constitute the core of the projection procedure employed in the following. Furthermore, all of the other assumptions upon which our projections are based derive from this basic premise.

What is required, then, is to examine the sources of national requirement projections, and the assumptions implicit in those projections, as a way of laying the necessary groundwork for the set of state projections delineated below. Since health manpower questions have typically been treated in fragmented or ad hoc ways, we clearly have not assessed all health manpower projections at the national or other levels. Rather, we have examined and utilized the only national studies (to our knowledge) which consider the stock of health manpower in a fairly comprehensive and consistent fashion, viz., the continuing set of studies conducted by the Health Manpower Bureau of the National Institutes of Health and, more importantly, the work on the National Industry-Occupation Matrix (BLS Matrix) conducted by the Bureau of Labor Statistics of the U.S. Department of Labor. For reasons of consistency and context, the latter source proved to be of enormous value, and accordingly was the one most fully utilized in the following.[1]

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[1] See Bureau of Labor Statistics, loc. cit., for a discussion of the technique and the advantages of using it.

Indeed, we have used the BLS Matrix as a framework for the projections in much the same fashion as Census data were used in the trend analysis described above. The reasons are that occupational categories and industry divisions are defined in the BLS Matrix in approximately the same fashion as in the Census of Population, and that the framework of the Matrix projections is consistent with the framework used here for analyzing health manpower. As before, BLS Matrix coefficients were employed (with slight modification) as "control totals" and detailed occupational projections were made to fit into these totals. The detailed projections primarily used materials prepared by the National Institutes of Health. Although crude, we believe that these procedures yielded reasonable results, at least from the point of view of orienting the direction of needed policy changes in the health manpower area.

The one disadvantage of utilizing the BLS Matrix is that it provides projection coefficients only for the period 1970-1980. Since we were interested in a somewhat longer period, viz., 1970-1985, we projected Ohio employment requirements via the BLS Matrix for the period 1970-1980, tested and refined the estimates, and then extrapolated them in log-linear fashion over the period 1980-1985. Thus, the next section considers the 1980 control projections and their justification; a subsequent section considers detailed occupational projections which rely on supplementary material and extrapolations off of this base.

HEALTH MANPOWER REQUIREMENTS, 1970-1980

The BLS Matrix, in simple terms, provides a set of coefficients for determining both the occupational and industrial distributions of total employment, given an independent estimate of the total employed labor

force in the target year of the projection period. While the specific techniques used to establish such coefficients need not concern us here,[2] the basic assumptions underlying the preparation of the matrix are worth summarizing briefly. Two sets of assumptions are critical for present purposes. The first set relates to the conditions assumed to prevail over the planning period in the nation as a whole. These include, among other things, that both the labor force and employment will grow at slightly faster rates than they have over the recent past; the "international climate will improve"; the "institutional framework of the American economy will not change drastically"; and that "economic, social, technological, and scientific trends will continue" at roughly the same pace as they have over the last ten years.[3]

The second set of assumptions relate specifically to the health service sector. While not all of the assumptions used in this case by the BLS Matrix are spelled out, a careful reading suggests the following major premise. It is that there will be no major change in the institutional setting or organization of the way in which health care services are delivered, except from the cumulative effects of changes already under way. In particular, the projections assume that increased income, expansion of public and private insurance coverage, higher levels of educational attainment, and some related demographic variables will cause demand for health care to grow cumulatively in roughly the same way and at approximately the same rate as it has over

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[2]The interested reader is referred to the four volume publication cited above.

[3]Ibid., Volume IV, p.3.

the past five to ten years. While expansion of factors relating to the utilization of health care services, particularly health insurance coverage, are expected to raise the overall level of health service use, in other words, there is no anticipation that it will create substantial shifts in the pattern of use. Briefly put, this is a critical assumption, and one which obviously affects the use of the BLS Matrix approach. It is worth noting, then, that approximately the same assumption is utilized in the independent projection work of the National Institutes of Health.[4] Hence, it is the premise adopted for our working purposes.

Given these assumptions, the application of the BLS Matrix approach requires, in the first instance, an estimate of the total labor force and total employment in the State in the target year of the projection period. These estimates, in turn, require a set of estimates (and corresponding assumptions about) population growth, labor force participation rates, and overall employment policy. Needless to say, a study of limited scope such as the present one could not afford to assess such factors in detail and thereby could not provide a definitive set of projections of these demographic variables. Nonetheless, we utilized available data as best as we could, and have predicated our manpower estimates on the following projected demographic base.

Specifically, we project that total population in the State will grow at a somewhat more rapid annual average rate over the period 1970-1985 than the rate experienced during the period 1960-1970.[5] Thus

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[4]C.f., M.Y. Pennel and D. Hoover, "Allied Health Manpower Supply and Requirements: 1950-1980" Health Manpower Source Book 21 (Washington: U.S. Government Printing Office, 1970) pp. 9-10.

[5]Our estimates are derived from U.S. Bureau of the Census, "Population Estimates and Projections" Current Population Reports, Series P-25, no. 477 (March, 1972), Table 1, Column I-C.

population is expected to increase from the 1970 figure of 10.6 million to approximately 12.0 million persons in 1980 and 12.8 million persons in 1985. More important perhaps is that the labor force is projected to increase at a somewhat faster rate than population, viz., 1.7 percent per annum versus the rate of 1.3 percent per year for total population. Assuming that the proportion of total population accounted for by persons fourteen years or less will decline slightly over the period 1970-1985 and utilizing the BLS' estimate of the overall rate of labor force participation for Ohioians,[6] we project that the labor force will increase from 4,234,500 persons in 1970 to approximately 5,000,000 in 1980, and about 5,400,000 in 1985. Furthermore, if one adjusts this figure to take account of an unemployment rate roughly equivalent to the rate prevailing at the time of the 1970 Census, it yields a projection of total employment; we project that employment will grow from 4,063,800 to 4,800,000 in 1980. This implies a growth rate of about 1.75 percent per year, or a rate about 0.25 percent more rapid than that experienced between 1960-1970.

If one accepts this employment figure either as being a reasonable forecast or as a reasonable goal, it is possible to utilize the BLS Matrix to forecast health-related employment in 1980. Furthermore, if one assumes that (with only slight modifications) the pattern of health-related employment will correspond to the national pattern--which is roughly what the historical record reviewed above suggests we should assume--then the employment pattern displayed in Table III.1 should constitute a reasonable projection of health manpower requirements in the State for the period 1970-1980.

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[6]Bureau of Labor Statistics, loc. cit., Volume I, Appendix B, Table 2, p. 77.

Table III.1

Projected Health Manpower Requirements by Industry Division and Major Occupational Category, State of Ohio, 1980 (In Thousands)

Major Occupational Category	Projected Number of Employed Persons			
	All Industries	Health Service Industry		
		Total	Hospitals	Other Health & Medical Services
TOTAL, ALL OCCUPATIONS	4,800.0	318.0	196.0	122.0
Health Occupations	233.0	211.0	134.0	77.0
Core Practitioners	37.0	28.0	5.0	23.0
Allied Personnel: Skilled	87.0	80.0	58.0	22.0
Allied Personnel: Semi-skilled	109.0	103.0	71.0	32.0
Other Occupations	4,567.0	107.0	62.0	45.0
Professional, Technical, & Related	658.0	9.0	5.0	3.0
Managerial & Related	480.0	7.0	3.0	4.0
Clerical	874.0	50.0	22.0	28.0
Others, n.e.c.	2,555.0	41.0	31.0	10.0

As can be seen, the BLS Matrix projections as translated to the State level suggest a substantial increase in employment opportunities for persons trained in health-related fields. The total number of jobs in health occupations, for instance, is projected to increase from about 148,000 in 1970 to 233,000 in 1980, or an absolute increase of roughly 57 percent. Within that category, employment in allied health occupations is projected to rise from 121,700 in 1970 to 196,000 in 1980. Simultaneously, total employment in the health service industry *per se* is projected to increase from 216,000 persons to 318,000 persons, i.e., to increase over the decade by about 47 percent. This industry division will account, therefore, for approximately 6.6 percent of total employment. It is of interest to point out, moreover, that roughly a third of all employees in this industry are forecast to be in non-health-related occupations, e.g., in managerial and clerical functions.

Now the critical question in regard to this set of employment projections is the extent to which they imply shifts in the manpower structure over the next decade beyond those expected as a function of cumulative trend factors. Table III.2 provides some insight into this question by comparing historic and projected growth rates. With respect to total employment in the health service industry, for example, there appears to be no considerable shift in parameters beyond those which would have been expected if simple extrapolation techniques had been used. It is true, of course, that the structural components of the industry are projected to change at differential rates. Hospital employment, in particular, will grow at a slower rate than will other components of the system, although hospitals will actually account for a greater share of total employment in 1980 than in 1970.

Table III.2

Comparison of Projected and Historical Growth Rates of Employment in Health Occupations and the Health Service Industry, State of Ohio, 1950-1980

Health Occupations and Industry Divisions	Average Annual Growth Rates		
	1970-1980	1960-1970	1950-1970
Health Occupations, Total	4.7	3.6	3.9
Core Practitioners	3.5	1.1	1.2
Allied Personnel: Total	4.9	4.3	4.7
Skilled	3.9	4.1	4.2
Semi-skilled	5.7	4.5	5.3
Health Service Industry, Total	4.0	4.7	4.8
Hospitals	3.4	4.3	5.2
Other Health & Medical Services	5.0	5.8	4.2

SOURCE: Computed from Tables III.1, II.1 and II.6.

Specifically, the hospital component is projected to increase from 3.5 percent of total employment (or about two-thirds of industry employment) to 4.1 of total employment (or 61 percent of the industry total). This fact, however, does not necessarily constitute a major reversal or abatement of the trend toward hospital utilization. Rather, as has been the trend in non-health-related areas, it appears that the technology of hospital services will change to more capital-intensive techniques. This will result in a corresponding decrease in the rate of growth of hospital employment. The BLS cites the following as illustrations:[7]

> " the growing use of disposable plastic and paper surgical gloves, caps, masks, hypodermic needles, and other hospital items is expected to temper needs for workers who perform laundry and sterilization duties. Furthermore, new hospitals will increasingly incorporate labor saving innovations, such as new tray-assembly lines, that reduce the need for kitchen workers."

More important is whether or not major shifts are expected to occur in the occupational structure of health-related employment. As Table III.2 shows, the projections in this case do show a reasonably harsh break with past trends. Given its importance to the allied health manpower field, this difference is worth exploring in some detail. To begin with, the employment projections indicate that while allied personnel may increase at only a slightly higher rate per annum than they have over the recent past, the total stock of health manpower is required to grow at a much more rapid pace. This is due to the fact that requirements for core practitioners, particularly physicians, are projected to grow at almost three times the annual average rate experienced over the past twenty years.

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[7] Ibid., Volume II, p. 118.

Now, if there is some balance between the requirements for and the supply of core personnel over the next decade, then the structural characteristics of the health manpower stock presumably should look similar to those shown in Table III.1. But if supply conditions do not develop in this fashion, and if (as suggested earlier), lesser-skilled personnel are likely to be substituted for higher-skilled personnel in short supply, then we run the risk of understating allied manpower employment prospects. Indeed, if one assumes that core practitioners grow at half the necessary projected rate, and that the technical coefficients or relationships between core and allied workers over the period 1960-1970 are maintained, projections of required skilled and semi-skilled allied workers would increase to about 105,000 and 119,000 persons respectively. These figures are, respectively, about 20 and 9 percent higher than the projections shown in Table III.1.

Although we have adopted the more conservative estimates for the detailed allied health manpower projections below, the possibility of a shift in health employment patterns is clearly worrisome. Since, it is difficult to justify any choice in this area, however, we have decided simply to treat these estimates as constituting a range within which requirements might be expected to fall. Thus, the projection of required core practitioners in 1980 is between 31,000 and 37,000 persons, while for skilled and semi-skilled personnel, requirements are 87,000-105,000 and 109,000-119,000 respectively. The point of the technological shift and substitution possibility is, paradoxically, that the <u>low</u> figure in the projection range for core practitioners corresponds to the <u>high</u> figures in the allied personnel projections and <u>vice versa</u>. As suggested, we have adopted the lower allied manpower figures for detailed projection

purposes. As a result, they may be considered minimum requirements for the period in question.

We believe, nonetheless, that these projections of the distribution of major health occupational categories are reasonable ones, and may be used as framework figures for the remainder of our work. This being so, it may be worthwhile at this point to raise the question of the impact that fulfilling these requirements will have on the availability of health manpower in the State over the course of the next decade. Such impacts are contingent upon a host of factors, of course, but as a simple overview we examine their implications with respect to the ratios of health manpower to population.

For instance, the 1980 projections imply a ratio of roughly 309 core practitioners per 100,000 population, which is a sizable increase over the ratio of 245 per 100,000 prevailing in 1970. Similarly, the ratio of skilled allied personnel per 100,000 population is projected to increase from 557 in 1970 to 725 in 1980; and semi-skilled allied manpower from the present 586 per 100,000 to 909 per 100,000 in 1980. Given the assumptions upon which the projections are based, as well as the fact that total population in the United States is projected to grow somewhat faster than the population of Ohio, the State ratios should be close to, if not slightly greater than, the national averages in 1980. A slight improvement is projected, in other words, in the ratios of health personnel to population ratios for the State relative to the Nation. As before, of course, this is most dramatic in the case of core personnel, and much depends upon the extent to which these requirements can be fulfilled.

While the availability of health manpower per capita is projected to improve overall, the actual number of health workers available to various

population groups will obviously depend upon the regional distribution or location of these personnel. The only realistic projection that one can make in this regard, however, is that the trend of health manpower employment opportunities becoming ever more heavily concentrated in the metropolitan areas of the State will continue over the next decade. This means that the prevailing disparity in the availability of health manpower resources between urban and rural areas (as well as among the various regions of the State) will, at best, remain the same; it is more probable that the gap will widen over time. An effective solution to this problem will require concerted and broad-gauged efforts to change the distribution of health care services in the State, either through a systematic policy of regionalization or through programs designed to redistribute health services (as currently delivered) to those areas that are presently under-served. Obviously, we cannot spell out the implications of such policy alternatives, for it would take us well beyond the scope of this paper. In limited form, however, we can indicate where the need for distributional changes are required.

Table III.3, for instance, computes the differential growth paths required if each region of the State is to have the same number of employed persons in major health-related occupational groups per capita in 1980. That is, we have computed to percentage changes required in the employment of health manpower over 1970-1980, assuming that the ratios per 100,000 population in each region in 1980 would be equal, i.e., match the State average. As can be seen, the differential rates of change are required because of the considerable disparities prevailing in 1970 (See Table II.10). We do not assume, of course, that such regional disparities will actually be eliminated, but these computations do show,

Table III.3

Projected Percentage Increase in Health Manpower Employment Required to Equalize Regional Manpower/Population Ratios in 1980, by Major Health Occupation Categories and Regions, State of Ohio, 1970-1980

Region[a]	Projected Percentage Change in Population 1970-1980	Percentage Increase Required in Employment in Health Occupations, 1970-1980		
		Total Health Manpower	Core Practitioners	Allied Health Personnel
TOTAL, STATE OF OHIO	12.5	57.6	41.7	61.0
Region I	12.4	49.9	53.4	49.2
Region II	15.0	82.1	85.6	81.1
Region III	11.0	71.3	64.5	72.5
Region IV	11.7	49.4	23.3	55.8
Region V	16.4	57.0	36.0	62.0
Region VI	11.9	48.9	16.7	56.9
Region VII	10.7	68.5	54.0	71.2
Region VIII	11.0	60.0	79.9	56.4
Region IX	12.4	63.6	158.2	51.8
Region X	12.8	65.3	43.2	70.2
Region XI	6.6	71.4	108.6	67.1

a. As defined in Table II.3.

SOURCE: Population projections are estimates based on total figures in U.S. Bureau of the Census, "Population Estimates and Projections" Current Population Report Series P-25, No. 477 (March, 1972) Table 1 and county weights contained in State of Ohio, Development Department, Economic Research Division, Ohio Population Forecasts n.d.

however indirectly, the areas of the State that should be accorded higher or lower priority for various types of health personnel over the course of the next decade.

As might have been expected, the higher priority areas are those which either had low manpower/population ratios to begin with, or have prospects for changes in total population which differ significantly from the mean. For example, Region II consistently ranks high in terms of the magnitude of change required to bring it close to the State average; it is also projected to have an increase in population greater than the average increase for the State as a whole. The same is true with respect to the requirements for the Southeastern part of the State, but here population is projected to grow at a substantially lower rate than other regions. The counties which comprise Region XI are representative of the less-developed, slow growing, and under-served areas of the State; it perhaps goes without saying that such areas should be accorded priority in public programs designed to augment the supply of health-related manpower. We shall return to this point below.

OCCUPATIONAL PROJECTIONS, 1970-1985

Within the framework established above and recognizing that there will be obvious regional variations, this section sets forth our estimates or projections of allied health manpower requirements by detailed occupational category over the period 1970-1985. These projections were first made for the period 1970-1980. They were prepared within the "control totals" of Table III.1 with the aid of supplementary projections and materials obtained from publications of the U.S. Department of Labor and

the National Institutes of Health.[8] The 1970-1980 detailed results were then extrapolated in log-linear fashion over the period 1980-1985. The projections of gross requirements for the entire period are displayed in Table III.4.

A remarkable feature about these projections is the differential growth rates in employment opportunities as between nursing and other health-related job functions. As can be seen, the employment of registered nurses (which includes both associate and baccalaureate degree nursing) is projected to increase at a rate considerably below the average for allied manpower as a whole. For instance, over the period 1970-1980, the employed stock of R.N.'s is forecast to grow by a little more than a third, and between 1970-1985 by two-thirds. While the absolute numbers of nurses will continue to be the largest component of the allied manpower stock, the relative size of this component will fall over the period in question: from about 34 percent of the total to approximately 29 percent in 1980 and 27 percent in 1985. A plausible explanation for this trend is that it is simply a counterpart of the projected increases in other allied job functions. These jobs both complement and substitute for the services typically provided by the professional nurse and thus affect the requirements for nurses. Hence, the nurse will more and more specialize in those areas where only her special skills are appropriate or relevant. Such changes, nonetheless, contribute to tempering the numerical requirements for registered nurses.

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[8] In particular, Occupational Outlook Quarterly, especially Vol. 14, No. 4 (Winter, 1970) and U.S. Department of Health, Education, and Welfare, National Center for Health Statistics, Health Resources Statistics 1970 (Washington: U.S. Government Printing Office, 1971).

Table III.4

Projected Gross Requirements for Allied Health Personnel, by Selected Occupational Categories, State of Ohio 1980 and 1985

Occupational Category	Projected Requirements		Percent Change	
	1980	1985	1970-1980	1970-1985
TOTAL, ALL ALLIED OCCUPATIONS	196,000	248,000	61.0	103.7
Total, Selected Allied Occupations	170,300	213,000	54.5	92.9
Dental Assistants & Aides	8,500	11,500	88.9	155.5
Dental Hygienists	1,700	2,200	88.9	144.4
Dental Laboratory Technicians	1,800	2,300	63.6	109.1
Health & Hospital Librarians & Assistants	800	900	60.0	80.0
Health & Medical Record Technicians	4,000	5,000	60.0	100.0
Medical & Medical Laboratory Technologists	5,000	6,500	78.6	132.1
Medical & Medical Laboratory Technicians & Assistants	5,000	7,000	117.4	204.3
Nurses, Registered	57,000	68,000	39.0	65.9
Nurses, Practical	29,000	38,000	75.8	130.3
Nursing Aides, Orderlies, & Attendants	39,000	46,000	39.3	64.3
Radiologic Technologists	5,500	6,400	73.9	126.1
Radiologic Technicians & Assistants	2,500	4,000	73.9	126.1
Technicians & Technologists, n.e.c.	4,500	6,500	125.0	225.0
Therapists, Occupational	800	1,200	166.7	300.0
Therapists, Physical	1,500	2,300	140.0	268.0
Therapists, Other Specialists	1,200	1,700	100.0	183.0
Therapy Technicians & Assistants	2,500	3,500	257.1	400.0

Outside of nursing, the requirement projections show quite a different picture: most technologist, technician, assistant and therapist functions are projected to increase at a very rapid pace. As can be seen, employment prospects for most technologist and technician positions will more than double over the period 1970-1985, and four-fold increases are forecast for therapist and rehabilitative jobs. Indeed, therapy assistants and technicians (especially in occupational and physical therapy) are projected to be the single most rapidly expanding area in the allied health manpower field. It is, of course, an area which deserves considerable attention by those responsible for educational policy in the health area.

BALANCING ALLIED HEALTH MANPOWER REQUIREMENTS AND SUPPLY

Assuming that the gross requirement figures given above are reasonable estimates of employment prospects in the State over the period 1970-1985, we may now inquire into the likely supply conditions of health manpower and hence whether or not there is likely to be a balance between the two. Such an analysis is quite complicated, however, and there was insufficient information to carry out anything more than a very crude assessment of probable supply conditions. We have been able, however, to estimate the number of new entrants required in various occupational categories as well as estimate the extent to which the existing system for health education and training in Ohio appears to have the capacity (defined broadly) to supply these persons to the labor market. Although crude, we believe these estimates should be of considerable value to educational policy makers.

The reasons why there is insufficient information to carry out a detailed analysis of manpower supply are worth exploring briefly. In the

first place, it is clear that some proportion of the requirements for health workers will be met by those persons currently employed in health occupations who will continue to be so employed over the next decade. Thus, an estimate of the number of persons currently employed who will remain in the labor force, or conversely, the number who will die, retire, or otherwise leave the labor market, must be estimated. This estimate is then subtracted from gross needs to yield an approximate estimate of net manpower requirements. This computation, however, requires data on mortality rates, retirement rates, labor force participation rates, and occupational mobility patterns by health-related occupation for persons employed in Ohio; such detailed information, unfortunately, is nowhere available in the State. Second, given the geographic mobility of Americans, some portion of total health manpower requirements may be met by the net number of appropriately trained persons who migrate into and out of Ohio over the period in question. This calls for an estimate of net migration, and requires data on migration patterns by occupational category. Needless to say, these data are also extremely difficult to come by.

Third, detailed supply assessments require an estimate of the number of graduates from educational and training institutions (in Ohio) over the course of the projection period by type of program as well as estimates of the proportion of graduates who enter jobs (in Ohio) for which they have been trained (i.e., the labor force participation rate of graduates by type of training and occupation). These estimates require, at a minimum, trend data on graduates by program and some information (however sketchy) on the employment experience of graduates a year or two after leaving school. While one would not necessarily expect to find such

"follow-up" data on graduates, it is significant to point out that even consistent data on current enrollments and graduations from the formal training system proved extremely difficult to obtain in the State. Indeed, the educational information used here must be regarded as the weakest and most tenuous set of statistics in the entire paper.

For these reasons, we were forced to use data for the purposes at hand that are in many ways imperfect. Furthermore, we were forced to make a number of simplifying (and some would say, heroic) assumptions. In the first case, for instance, the absence of State information on the attrition to the current manpower stock by occupation required that we use the national estimates prepared by the Bureau of Labor Statistics.[9] Unfortunately, the use of national figures requires the assumption that the age structure and labor force behavior of Ohio's stock of health manpower is identical to the national average. Furthermore, the BLS estimates are limited in terms of occupational detail, and are reported in terms of gross rather than net rates. This meant, for instance, that we were forced to employ identical attrition rates for a number of different occupational groups, although differentials are likely to exist between and among occupations.

In the case of the gross separation rates, we employed the rates as reported for males but reduced the reported rates for females arbitrarily by one percentage point. This means that we arbitrarily assumed that one percent of females leaving the labor force each year will return to it sometime later during the projection period. Since this procedure was followed, however, we were forced to estimate the sex ratio of employment

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[9] loc. cit., Volume I, Appendix A, pp. 64-67.

in individual occupations. With the exception of nursing personnel, this was accomplished by assigning the overall sex ratio for allied personnel as reported in the 1970 Census to each occupational group. Such a procedure is obviously crude, but it helped to account for the substantial variations in the rates of labor force participation between males and females employed in health-related functions. Finally, these gross rates do not (by definition) account for departures from job functions stemming from occupational mobility. Since we are dealing with health occupations, we simply assumed that attrition from such movement would not be great; accordingly, no further adjustments to the rates reported by the BLS were made.

Given the absence of migration data by occupation, i.e., data relating locus of employment and locus of training, we used the simplifying assumption that net migration of appropriately trained health workers is zero. In other words, we assumed that the number of persons trained for health careers in Ohio schools who leave the State for employment elsewhere exactly equals the number of comparably trained persons from other States who find jobs locally. The difficulty in employing this assumption is that sketchy and impressionistic evidence suggests that Ohio has been a net "exporter" of trained manpower. This implies that we run the risk of understating training requirements; the availability of data, however, dictated that we run that risk.

Using these simplifying assumptions, we were able to estimate the net requirements for allied health manpower over the period 1970-1985. That is, with the data and assumptions discussed immediately above, it was possible to estimate the attrition to the 1970 manpower stock, and

hence the required annual new entrants to the labor market over the 15 year period. These projections are given in Table III.5.

As might be expected, the largest single set of net requirements are in nursing occupations; this stems not only from the fact that there is a large absolute number of nurses required over the projection period, but also because the attrition rates for these particular occupations are exceptionally high. Even allowing for a one percent rate of reentry into nursing, the attrition rates for professional and practical nurses are 3.6 and 4.6 percent per annum. The fact that these occupations are dominated by young females probably accounts for the relatively large number of separations from the labor force each year.

Since 1985 requirements were simple log-linear extrapolations off the 1970-1980 projections, the annual entrants over the last five years of the total projection period are larger than the first ten years of the period. The relative distribution between these two periods becomes, in effect, a time-phase for modification of the sources of allied health manpower supply. The educational system, for example, will have until the end of the decade to tool-up for the somewhat greater demands projected to be placed upon it in the early 'eighties. Recall, however, that these are indeed extrapolated trends; a more detailed assessment will clearly be necessary before too much stock is placed in these figures.

We come, finally, to the question of whether or not the capacity of the existing training system appears to be adequate from the point of view of its capacity to supply the requisite number of new entrants into various allied occupations (as shown in Table III.5). As suggested earlier, this final portion of the analysis posed significant technical problems, not the least of which was the absence of readily available

Table III.5

Projected Net Annual Requirements for Allied Health Personnel, by Occupational Category, State of Ohio 1970-1980 and 1980-1985

Occupational Category	Annual Net Requirements	
	1970-1980	1980-1985
Dental Assistants & Aides	550	700
Dental Hygienists	100	120
Dental Laboratory Technicians	100	125
Health & Hospital Librarians & Assistants	45	30
Health & Medical Record Technicians	225	250
Medical & Medical Laboratory Technologists	305	360
Medical & Medical Laboratory Technicians and Assistants	350	450
Nurses, Registered	2,850	3,150
Nurses, Practical	1,850	2,225
Nursing Aides, Orderlies, & Attendants	1,950	2,025
Radiologic Technologists	250	300
Radiologic Technicians & Assistants	250	300
Technicians & Technologists, n.e.c.	310	425
Therapists, Occupational	60	90
Therapists, Physical	100	175
Therapists, Other Specialists	80	110
Therapy Technicians & Assistants	200	215

data on enrollments and graduates from the existing training system as well as on the labor force participation rates of graduates. But there is a further difficulty, and one that data alone could not wholly answer. It is that the "appropriate" training for new entrants into allied health occupations must be determined or decided upon before such estimates can be made. In the case of those health occupations for which licensure is required, this decision is relatively easy; but for those occupations without such formal qualification standards (and these occupations constitute a very large percentage of the total allied job functions) the decision is not altogether an easy one. Given, furthermore, the patchwork quilt of training programs, each with their own curriculum and course duration, it is clear that even attempting to use present training standards offers few guidelines or criteria for such choice.

We believe that the determination of such standards and their administration is worthy of specialized research studies. Consequently, we make the assumption in the following discussion that the appropriate amount of training associated with a given occupational category is that currently required by licensure or certification requirements, or the typical amount of formal training currently attained by persons preparing for various allied health positions in Ohio. We assume, furthermore, that all new entrants to allied health labor markets will be so trained. In other words, we rule out the possiblility of new entrants attending only ad hoc, informal training programs, and assume that employers will necessarily seek persons who have been trained in formally organized courses of study. Such an assumption obviously may lead to over-stating training needs, but since it is applied equally to all occupations, we

feel that the relative priorities which emerge are unlikely to be wide of the mark.

With the aid of these assumptions, it was possible to estimate the approximate percentage of future annual need being satisfied by existing education and training programs throughout the State. These estimates are given in Table III.6. Three points are noteworthy about these figures: First, and foremost, the proportions have been calculated with respect to the estimated number of graduates in 1970-1971 in training programs located in Ohio. These estimates have been prepared in reference to information obtained through both the National Institutes of Health and various State agencies.[10] It must be stressed that the figures are estimates, and rough ones at that. Given the wide variation in the proportions, however, it is doubtful that priority areas would change radically with refined estimates of the number of graduates being turned out by these institutions.

Secondly, the fact that the estimated proportions refer only to the current period implies that drastic changes in policy may not be required if plans are already underway to expand the number or size of specific programs. That is, a sizable proportion of these programs have probably grown rapidly over the course of the last few years; if such growth is expected (or programmed) to continue over the next decade, it is likely that training requirements can be met without shifts in current policy. Although available information is sketchy, it appears, for instance, that the number of graduates from dental assistant programs almost doubled over the period 1963-1971. If graduates from these

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[10]See, for instance, the materials cited in Table III.6.

Table III.6

Proportion of Annual Net Requirements for Selected Allied Health Manpower[a] Satisfied by Estimated Number of Persons Being Graduated from Existing Education and Training Institutions, by Occupational Category
State of Ohio, Circa, 1970

Occupational Category	Proportion of Annual Net Requirements Satisfied by Estimated Number of Graduates (Percent)
Dental Assistants	62
Dental Hygienists	100+
Dental Laboratory Technicians	20
Health & Medical Record Technicians	n.a.
Medical & Medical Laboratory Technologists	98
Medical & Medical Laboratory Technicians	16
Nurses, Registered	85
Nurses, Practical	94
Radiologic Technologists Radiologic Technicians	76
Therapists, Occupational & Physical	50
Therapy Technicians & Assistants	17

a. For the period 1970-1980.

SOURCE: Computed from annual net requirements data in Table III.5, and education and training information contained in The Greater Cleveland Hospital Association Health Careers Educational Guide; Ohio EIS, Health Occupations Curricula in Universities, Colleges, Technical Institutes, Vocational High School, and Hospitals, 1971, Section V, pp. 1-21; U.S. Dept. of Health Education and Welfare, Public Health Services, Health Services and Mental Health Administration; Health Resources Statistics (Washington, D.C.: Government Printing Office, 1965-1971); U.S. Department of Health, Education and Welfare, Public Health Service, Bureau of Health Manpower Education, Allied Health Education in Junior Colleges, (Washington, D.C.: Government Printing Office, 1970)

programs continue to grow at roughly the same rate over the period 1970-1985, net requirements for persons employed in this occupational function would be fulfilled. Before educational policy changes can be established, then, it will be necessary to survey current plans and prospects of existing programs throughout the State.

Finally, let us point out that the estimated number of graduates are aggregates of an array of different types of programs. Included (where relevant) are programs operated in hospitals, secondary schools, technical institutes, junior colleges, and colleges and universities. It proved exceedingly difficult to estimate the relative contributions of each; consequently, they are reported in aggregate form. The significance of this point is that the figures refer to total need. This means, in turn, that the relative efforts or contributions of the several components of the training system must be coordinated to assure that they develop in consistent fashion. To the casual observer, such coordination does not appear to exist at present; hopefully, it can be developed in the future.

Given the above comments, Table III.6 shows the proportion of the annual net requirements (over the period 1970-1980) satisfied by the current number of students being graduated by the existing set of training programs in Ohio. In a fundamental sense, there are few surprises in these figures. The proportions of need accounted for by current graduations tends to be highest in those areas where growth in employment opportunities is not projected to be very rapid, e.g., nursing, and lowest in those areas where employment is projected to increase rapidly, e.g., therapy assistants. In other words, the priority attached to specific occupational

categories is inversely related to the proportions shown in Table III.6, and may be so interpreted for the purpose of this study.

Caution must be exercised, however, since among other things, the proportions do not account for any "slippage" between graduations and entrance into the labor market. We have been unable to compute adjustments for this factor, because of the absence of labor force participation rates by occupation and training. A recent study of registered nurses, however, shows activity rates for nurses below the age of twenty-five of about 85 percent. This implies that 115 nurses must be graduated for every 100 nurses required in the labor market.[11] There is reason to suppose that the participation rate for recent graduates in other occupations may be slightly higher; say on the order of 90 percent. If this rate is applied as an adjustment factor to the proportions shown in Table III.6, net requirements are being satisfied in only one occupation, viz., dental hygienists. All other programs will have to be augmented over the next decade by roughly the inverse of the proportion shown together with the adjustment for labor force participation.

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[11] S. Altman, Present & Future Supply of Registered Nurses, DHEW Publication 72-134 (Washington: U.S. Government Printing Office, 1971) pp. 108-110.

IV

POLICY IMPLICATIONS

Let us briefly sum up. This paper has had the limited objective of quantifying the employment trends and prospects of allied health workers in the State of Ohio. As we have seen, the health manpower stock has grown at a very rapid rate over the past twenty years and is projected to increase at even a faster pace over the coming decade. Since this rate of change has been and will continue to be in excess of the overall growth in total employment, health manpower employment will account for an even larger proportion of the work force in the coming decade. Health service industry employment in Ohio, for example, increased from 2.7 percent of the employed work force in 1950 to 5.5 percent in 1970; it is projected to account for 6.6 percent of total employment in the State in 1980. As such, it will not only be one of the fastest growing sectors of Ohio's economy but also one of the largest in absolute terms.

More important, perhaps, the analysis has shown that the growth in health-related employment has occurred in those job functions generally requiring less education and training than those occupations traditionally identified with the health care field, e.g., the physician. Such jobs were defined in this study as allied health manpower functions, and they have been expanding at three to four times the annual rate of growth of highly-trained core practitioners. Stemming from technological shifts as well as pressures to overcome the shortages

of highly skilled workers, the allied component of the health manpower structure now accounts for more than 82 percent of all health-related employment. More important is the projection that almost 85 percent of all health workers or roughly a quarter of a million persons will be performing allied occupational functions in 1985. Since this figure assumes that the supply of core health professionals will increase more rapidly than in the recent past, and since there is some evidence to suggest that allied workers are substituted for core personnel when the latter are in short supply, this 1985 employment projection may be considered a minimum figure.

In addition to the overall growth experienced and projected in health-related employment, several important concomitant trends emerged from the analysis. For one thing, health manpower employment is increasingly an urban phenomenon, with a majority of workers concentrated in the half-dozen largest metropolitan areas of the State. This trend has led, unfortunately, to considerable regional disparities in the availability of health manpower throughout the State. Another is that health employment is increasingly dominated by female workers, particularly young women, with the expected impact upon training costs, labor force participation and turnover. Finally, the analysis suggests that the specific occupational characteristics of the allied health manpower stock will shift over the coming decade. Most significant in this regard is while nursing occupations have been (and will continue to be) the largest component of the stock in absolute terms, these job functions will <u>decline</u> in relative importance over the next ten to fifteen years. At the same time, sizable increases in health technologist and technician jobs are forecast as are professional and technician

jobs in rehabilitative service functions, such as occupational and physical therapy. These occupations will increase in relative importance; they constitute the core of the occupation/training priorities which emerged from the study.

Although briefly stated, what do these trends imply for public policy, particularly educational policy? In our judgment, the principal policy implications of the analysis are as follows:

First, to the extent that public policy at all levels of government appears to be mandated to augment the supply of health personnel to maintain a reasonable balance with demand, the analysis suggests that the number of persons to be trained for health careers must increase substantially over the next decade. Accordingly, educational resources, both financial and real, must expand to operate the training system at the required level. This conclusion may appear to some to be self-evident, but it warrants emphasis because the education and training system is barely keeping pace with today's requirements, much less tomorrow's. Not unlike Alice, in other words, we shall have to run twice as fast to assure that we do not fall behind. This implies a greater commitment to and priority for health training at all levels of the educational structure than appears to exist at the present time.

While we did not, of course, undertake an examination of the total resource requirements for such an expansion of the health manpower training system, they are (in our estimation) likely to be sizable. Although Federal funding for such purposes will probably increase over the next decade, these funds in all likelihood will be inadequate to the needs as we have described them. Thus, increasing emphasis in State and local area budgets must be given to health-related education and training. To achieve

such increases will require that the health manpower training area be accorded high priority by those in public policy circles.

Second, apart from the general priority to be accorded health-related education, considerably greater attention must be given to the allied health manpower training. This implies a relative shift away from the traditional preoccupation with university-level programs toward concern for secondary school and junior-college level training. With this shift in emphasis should come a corresponding expansion in the role of the vocational and/or technical schools in training allied health personnel. Employment trends indicate a need for expansion of the number and types of such training programs. As delineated in greater detail above technologist and particularly technician and assistant job functions are forecast to increase in relative importance, and, in broad terms, the training system currently is not fully geared-up to meet these requirements. Expanded programs for therapy assistants, medical labortory assistants, dental assistants and the like will, therefore, be necessary. For these reasons, the adequacy of present programs must be evaluated and detailed plans made for future expansion. This is a role especially suited for the Ohio Advisory Council for Vocational Education, and one that should be accorded high priority by this group in the immediate period.

Third, as a function both of the expanding scope of formal health manpower training and the obvious interplay between the utilization of core and allied health personnel, there will be an increasing need for coordinating the entire health training system. That is, if the allied health manpower stock grows rapidly as our projections suggest and if, as our rudimentary analysis suggests, substitution among various health

skills will continue, then the amount and kind of allied health training required is a function of the number of core personnel trained in post-baccalaureate programs and vice versa. This means that there is an important interdependence between and among university, vocational, technical, and secondary school training programs as well as those provided in the private or voluntary sectors such as hospitals. Simply put, their plans need to be coordinated. Obviously, there is no satisfactory set of institutional relationships at the moment which can provide such guidance; but such institutional bridges must be built. A highly centralized process would probably be inappropriate or at least would not be feasible at the present time; but a coordinating body with representatives of the relevant areas, meeting periodically to exchange program information, would be of considerable value. The State Advisory Council for Vocational Education should play a leadership role in such a process; indeed, it should consider initiating such an expanded coordination mechanism. This assumes even greater importance in light of the fact that the projections of allied health manpower needs reported in this paper are contingent upon assumed changes in university and particularly post-baccalaureate training.

Fourth, within the context of allied health manpower training per se, the examination of both local and national trends as well as the projections of future requirements strongly suggest the need to modify the relative structure or combination of training programs. But rather than simply adding highly specialized programs for specific occupations, it is our judgment that new or expanded training programs should be designed with flexibility in mind. Rigidly defined programs designed to train for highly specialized occupational functions are

likely to yield short-term benefits, but at the expense of long-term flexibility in the supply of health manpower. Such flexibility is required, among other things, to minimize the "dead-end" nature of many jobs in the health field and hence to allow for upward mobility on the part of the health worker. Occupational flexibility will have the additional benefit of both encouraging more males to seek health-related job training, and creating incentives for females to remain in the labor market. In so doing, it will contribute to decreasing the total costs of training health manpower. To achieve such "open-endedness" in the training of allied health manpower will obviously require greater interest in innovative curricular approaches by those involved in programming vocational and technical schools.

Fifth, since our analysis clearly shows a trend in Ohio toward concentration of health-related employment opportunities in metropolitan areas, considerable thought must be given to the location of new training programs throughout the State. Two somewhat distinct locational patterns suggest themselves as possibilities in this regard. If training programs (particularly those for technician and assistant level jobs) are designed to attract local students for employment in local labor markets, and if efforts will be made to arrest current locational trends by promoting an equal distribution of health services across the various regions of the State, one possibility is to locate training programs in those areas where there is presently unfavorable health manpower/population ratios. Specifically, the unfavorable position of rural areas in general and the southeastern part of the State in particular should be accorded priority in the location of new or expanded programs.

If, however, efforts will be made to regionalize the health service system (say, with more and more specialized services available as one moves closer to the core of the region) then training programs should be located in proximity to these regional cores. Although urban in nature, such programs should be designed to attract rural students and prepare them primarily for work in the metropolitan areas. In either case, the significant point is that the location of training programs is contingent upon more far-reaching efforts to deal with the disparities in the distribution of health services. If such efforts are not forthcoming, there is little choice but to locate training programs where the job opportunities are expected to be, viz., in highly urbanized areas. This is, however, clearly an inferior solution, and one unfortunately that will do little more than exacerbate the problem of health manpower availability in the rural areas.

Sixth, changes in the supply of allied health manpower cannot rely exclusively on education and training policies. Efforts to make allied manpower markets more efficient are also required. While these factors have not been analyzed in any depth in the present study, they nonetheless have implications for education and training in this field. At root, what is required is to provide for greater advancement opportunities within specific health occupations, greater incentives to encourage females to remain in the labor market, and to attract more males into health-related jobs.

This point may be illustrated with reference to professional nurses: essentially because this occupation is dominated by females, and also because there are few opportunities either to earn higher

salaries or to move on a career ladder beyond the functions normally performed by nurses, nursing loses substantial numbers of persons each year. These separations from the labor force are not without cost, of course, particularly the costs of training more nurses than would normally be required if different working patterns were developed. The fact is that in 1972 there were approximately 4,000 more nurses registered in the State than are projected to be required in 1980. If even a small fraction of these nurses could be recruited back into the field, there would be little need to expand nursing education beyond its present level over the next decade. An assessment of such a possibility in Ohio should be carried out before any substantial changes in nursing education are undertaken.

Finally, and on a somewhat technical note, there is a need to improve the monitoring of allied health manpower employment and educational trends in the State. As we were at pains to point out throughout this analysis, insufficient and frequently conflicting data are currently available to carry out such a task. For obvious reasons, there is need to remedy this situation. Furthermore, to the extent that allied personnel become increasingly important, this task cannot be wholly accomplished by refining licensure and registration data. In our judgment, the only effective solution is to survey health institutions periodically on a comprehensive basis so as to obtain a consistent picture of changes in employment, training needs, and the like. Only in this way will appropriate information be available for wise and judicious decision-making in an area of critical public concern.